Armaments Race
Arthur C. Clarke
1954 Popular Publications Inc.

As I've remarked on previous occasions, no-one has ever succeeded in pinning-down Harry Purvis, prize raconteur of the "White Hart", for any length of time. Of his scientific knowledge there can be no doubt-but where did he pick it up? And what justification is there for the terms of familiarity with which he speaks of so many Fellows of the Royal Society? There are, it must be admitted, many who do not believe a single word he says. That, I feel, is going a little too far, as I recently remarked somewhat forcibly to Bill Temple.

"You're always gunning for Harry," I said, "but you must admit that he provides entertainment. And that's more than most of us can say."

"If you're being personal," retorted Bill, still rankling over the fact that some perfectly serious stories had just been returned by an American editor on the grounds that they hadn't made him laugh, "step outside and say that again." He glanced through the window, noticed that it was still snowing hard, and hastily added, "Not today, then, but maybe sometime in the summer, if we're both here on the. Wednesday that catches it. Have another of your favorite shots of straight pineapple juice?"

"Thanks," I said. "One day I'll ask for a gin with it, just to shake you. I think I must be the only guy in the White Hart who can take it or leave it-and leaves it."

This was as far as the conversation got, because the subject of the discussion then arrived. Normally, this would merely have added fuel to the controversy, but as Harry had a. stranger with him we decided to be polite little boys.

"Hello, folks," said Harry. "Meet my friend Solly Blumberg. Best special effects man in Hollywood."

"Let's be accurate, Harry," said Mr. Blumberg sadly, in a voice that should have belonged to a whipped spaniel. "Not in Hollywood. out of Hollywood."

Harry waved the correction aside.

"All the better for you. Sol's come over here to apply his talents to the British film industry."

"There is a British film. industry?" said Solly anxiously. "No one seemed very sure round the studio."

"Sure there is. It's in a very flourishing condition, too. The Government piles on an entertainments tax that drives it to bankruptcy, then keeps it alive with whacking big grants. That's the way we do things in this country. Hey, Drew, where's the Visitor's Book? And a double for both of us. Solly's had a terrible time-he needs a bit of building up."

I cannot say that, apart from his hang-dog look, Mr. Blumberg had the appearance of a man who had suffered extreme hardships. He was neatly dressed in a Hart, Schaffner and Marx suit, and the points of his shirt collar buttoned down somewhere around the middle of his chest. That was thoughtful of them as they thus concealed something, but not enough, of his tie. I wondered what the trouble was. Not un-American activities again, I prayed: that would trigger off our pet communist, who at the moment was peaceably studying a chess-board in the corner.

We all made sympathetic noises and John said rather pointedly: "Maybe it'll help to get it off your chest. It will be such a change to hear someone else talking around here."

"Don't be so modest, John," cut in Harry promptly. "I'm not tired of hearing you yet. But I doubt if Solly feels much like going through it again. Do you, old man?"

"No," said Mr. Blumberg. "You tell them."

("I knew it would come to that," sighed John in my ear.)

"Where shall I begin?" asked Harry. "The time Lillian Ross came to interview you?"

"Anywhere but there," shuddered Solly. "It really started when we were making the first 'Captain Zoom' serial."

"'Captain Zoom'?" said someone ominously. "Those are two

very rude words in this place. Don't say you were responsible for that unspeakable rubbish!"
"Now boys!" put in Harry in his best oil-on-troubled-waters voice. "Don't be too harsh. We can't apply our own high standards of criticism to everything. And people have got to earn a living. Besides, millions of kids like Captain Zoom. Surely you wouldn't want to break their little hearts-and so near Xmas, too!"
"If they really liked Captain Zoom, I'd rather break their little necks."
"Such unseasonable sentiments! I really must apologize for some of my compatriots, Solly. Let's see, what was the name of the first serial?"
"'Captain Zoom and the Menace from Mars'."
"Ali yes, that's right. Incidentally, I wonder why we always are menaced by Mars? I suppose that man Wells started it. One day we may have a big interplanetary libel action on our hands-unless we can prove that the Martians have been equally rude about us.
"I'm very glad to say that I never saw 'Menace From Mars' ("I did;" moaned somebody in the background. "I'm still trying to forget it.")-but we are not concerned with the story, such as it was. That was written by three men in a bar on Wilshire Boulevard. No-one is sure whether the Menace came out the way it did because the script writers were drunk, or whether they had to keep drunk in order to face the Menace. If that's confusing, don't bother. All that Solly was concerned with were the special effects that the director demanded.
"First of all, he had to build Mars. To do this he spent half an hour with 'The Conquest of Space', and then emerged with a sketch which the carpenters turned into an over-ripe orange floating in nothingness, with an improbable number of stars around it. That was easy. The Martian cities weren't so simple. You try and think of completely alien architecture that still makes sense. I doubt if it's possible-if it will work at all, someone's already used it here on Earth. What the studio finally built was vaguely Byzantine with touches of Frank Lloyd Wright. The fact that none of the doors led anywhere didn't really matter, as long as there was enough room on the sets for the swordplay and general acrobatics that the script demanded.
"Yes-swordplay. Here was a civilization which had atomic
power, death-rays, spaceships, television and suchlike modem conveniences, but when it came to a fight between Captain Zoom and the evil Emperor Klugg, the clock went back a couple of centuries. A lot of soldiers stood round holding deadly-looking ray-guns, but they never did anything with them. Well, hardly ever. Sometimes a shower of sparks would chase Captain Zoom and singe his pants, but that was all. I suppose that as the rays couldn't very well move faster than light, he could always outrun them.
"Still, those ornamental ray-guns gave everyone quite a few headaches. It's funny how Hollywood will spend endless trouble on some minute detail in a film which is complete rubbish. The director of Captain Zoom had a thing about ray-guns. Solly designed the Mark 1, that looked like a cross between a bazooka and a blunderbuss. He was quite satisfied with it, and so was the director-for about a day. And then the great man came raging into the studio carrying a revolting creation of purple plastic with knobs and lenses and levers.
"'Lookit this, Solly!' he puffed. 'Junior got it down at the Supermarket-they're being given away with packets of Crunch. Collect ten lids, and you get one. Hell, they're better than ours! And they work!'
"He pressed a lever, and a thin stream of water shot across the set and disappeared behind Captain Zoom's spaceship, where it promptly extinguished a cigarette that had no right to be burning there. An angry stage-hand emerged through the airlock, saw who it was had drenched him, and swiftly retreated, muttering things about his Union.
"Solly examined the ray-gun with annoyance and yet with an expert's discrimination. Yes, it was certainly much more impressive than anything he'd put out. He retired into his office and promised to see what he could do about it.

"The Mark 11 had everything built into it, including a television screen. If Captain Zoom was suddenly confronted by a charging hickoderm, all he had to do was to switch on the set, wait for the tubes to warm up, check the channel selector, adjust the fine tuning, touch up the focus, twiddle with the Line and Frame holds- and then press the trigger. He was, fortunately, a man of unbelievably swift reactions.
"The director was impressed, and the Mark 11 went into
production. A slightly different model, the Mark Ila, was built for the Emperor Klugg's diabolical cohorts. It would never do, of course, if both sides had the same weapon. I told you that Pandemic Productions were sticklers for accuracy.
"All went well until the first rushes, and even beyond. While the cast was acting, if you can use that word, they had to point the guns and press the triggers as if something was really happening. The sparks and flashes, however, were put on the negative later by two little men in a darkroom about as well guarded as Fort Knox. They did a good job, but after a while the producer again felt twinges in his overdeveloped artistic conscience.
"'Solly,' he said,, toying with the plastic horror which had reached Junior by courtesy of Crunch, the Succulent Cereal-Not a Burp in a Barrel-'Solly, I still want a gun that does something.'
"Solly ducked in time, so the jet went over his head and baptized a photograph of Louella Parsons.
"'You're not going to start shooting all over again!' he wailed.
"'Nooo,' replied the producer, with obvious reluctance. 'We'll have to use what we've got. But it looks faked, somehow.' He ruffled through the script on his desk, then brightened up.
"'Now next week we start on Episode 54-"Slaves of the SlugMen." Well, the Slug-:Men gotta have guns, so what I'd like you to do is this-'
"The Mark III gave Solly a lot of trouble. (I haven't missed out one yet, have I? Good.) Not only had it to be a completely new design, but as you'll have gathered it had to 'do something'. This was a challenge to Solly's ingenuity: however, if I may borrow from Professor Toynbee, it was a challenge that evoked the appropriate response.
"Some high-powered engineering went into the Mark III. Luckily, Solly knew an ingenious technician who'd helped him out on similar occasions before, and he was really the man behind it. ('I'll say he was!' said Mr. Blumberg gloomily.) The principle was to use a jet of air, produced by a small but extremely powerful electric fan, and then to spray finely divided powder into it. When the thing was adjusted correctly, it shot out a most impressive beam, and made a still more impressive noise. The actors were so scared of it that their performances became most realistic.
"The producer was delighted-for a full three days. Then a dreadful doubt assailed him.
11 'Solly,' he said, 'those damn guns are too good. The Slug-Men can beat the pants off Captain Zoom. Well have to give him something better!
I "it was at this point that Solly realized what had happened. He had become involved in an armaments race.
"Let's see, this brings us to the Mark IV, doesn't it? How did that work?-oh yes, I remember. It was a glorified oxy-acetylene burner, with various chemicals injected into it to produce the most beautiful flames. I should have mentioned that from Episode 50'Doom on Deimos'-the studio had switched over from black and white to Murkicolor, and great possibilities were thus opened up. By squirting copper or strontium or barium into the jet, you could get any colour you wanted.
"If you think that by this time the producer was satisfied, you don't know Hollywood. Some cynics may still laugh when the motto 'Ars Gratia Artis' flashes on the screen, but this attitude, I submit, is not in accordance with the facts. Would such old fossils as Michelangelo, Rembrandt or Titian have spent so much time, effort and money on the quest for perfection as did Pandemic Productions? I think not.

"I don't pretend to remember all the Marks that Solly and his ingenious engineer friend produced during the course of the serial. There was one that shot out a stream of coloured smoke-rings. There was the high-frequency generator that produced enormous but quite harmless sparks. There was a particularly ingenious curved beam produced by a jet of water with light reflected along inside it, which looked most spectacular in the dark. And finally, there was the Mark 12."
"Mark 13," said Mr. Blumberg.
"Of course-how stupid of me! What other number could it have been! The Mark 13 was not actually a portable weapon though some of the others were portable only by a considerable stretch of the imagination. It was the diabolical device to be installed on Phobos in order to subjugate Earth. Though Solly has explained them to me once, the scientific principles involved escape my simple mind . . . . However, who am I to match my brains against the intellects responsible for Captain Zoom? I can only

report what the ray was supposed to do, not how it did it. It was to start a chain reaction in the atmosphere of our unfortunate planet, making the nitrogen and the oxygen in the air combine with highly deleterious effects to terrestrial life., -
"I'm not sure whether to be sorry or glad that Solly left all the details of the fabulous Mark 13 to his talented assistant. Though I've questioned him at some length, all he can tell me is that the thing was about six feet high and looked like a cross between the 200 inch telescope and an anti-aircraft gun. That's not very helpful, is it?
,,He also says that there were a lot of radio tubes in the brute, as we'll as a thundering great magnet. And it was definitely supposed to produce a harmless but impressive electric arc, which could be distorted into all sorts of interesting shapes by the magnet. That was what the inventor said, and, despite everything, there is still no reason to disbelieve him.
"By one of those mischances that later turns out to be providential, Solly wasn't at the studio when they tried out the Mark 13. To his great annoyance, he had to be down in Mexico that day. And wasn't that lucky for you, Solly! He was expecting a long-distance call from one of his friends in the afternoon, but when it came through it wasn't the kind of message he'd anticipated.
"The Mark 13 had been, to put it mildly, a success. No-one knew exactly what had happened, but by a miracle no lives had been lost and the fire department had been able to save the adjoining studios. It was incredible, yet the facts were beyond dispute. The Mark 13 was supposed to be a phony death-ray-and it had turned out to be a real one. Something had emerged from the projector, and gone through the studio wall as if it wasn't there. Indeed, a moment later it wasn't. There was just a great big hole, beginning to smolder round the edges. And then the roof fell in . . . .
"Unless Solly could convince the F.B.I. that it was all a mistake, he'd better stay the other side of the border. Even now the Pentagon and the Atomic Energy Commission were converging upon the wreckage . . . .
"What would you have done in Solly's shoes? He was innocent, but how could he prove it? Perhaps he would have gone back to face the music if he hadn't remembered that he'd once hired a man who'd campaigned for Henry Wallace, back in '48. That might take
some explaining away: besides, Solly was a little tired of Captain Zoom. So here he is. Anyone know of a British film company that might have an opening for him? But historical films only, please. He won't touch anything more up-to-date than cross-bows."

ENCOUTNER AT DAWN (Originally published as "Encounter In The Dawn" 1953 by Ziff - Davis Publishing Co.

Arthur C. Clarke

It was in the last days of the Empire. The tiny ship was far from home, and almost a hundred light-years from the great parent vessel searching through the loosely packed stars at the rim of the Milky Way. But even here it could not escape from the shadow that lay across civilization: beneath that shadow, pausing ever and again in their work to wonder how their distant homes were faring, the scientists of the Galactic Survey still labored at their never-ending task.

The ship held only three occupants, but between them they carried knowledge of many sciences, and the experience of half a lifetime in space. After the long interstellar night, the star ahead was warming their spirits as they dropped down toward its fires. A little more golden, a trifle more brilliant than the sun that now seemed a legend of their childhood. They knew from past experience that the chance of locating planets here was more than ninety per cent, and for the moment they forgot all else in the excitement of discovery.

They found the first planet within minutes of coming to rest. It was a giant, of a familiar type, too cold for protoplasmic life and probably possessing no stable surface. So they turned their search sunward, and presently were rewarded.

It was a world that made their hearts ache for home, a world where everything was hauntingly familiar, yet never quite the same. Two great land masses floated in blue-green seas, capped by ice at either pole. There were some desert regions, but the larger part of the planet was obviously fertile. Even from this distance, the signs of vegetation were unmistakably clear.

They gazed hungrily at the expanding landscape as they fell down into the atmosphere, heading toward noon in the subtropics. The ship plummeted through cloudless skies toward a great river, checked its fall with a surge of soundless power, and came to rest among the long grasses by the water's edge.

No one moved: there was nothing to be done until the automatic instruments had finished their work. Then a bell tinkled softly and the lights on the control board flashed in a pattern of meaningful chaos. Captain Altman rose to his feet with a sigh of relief.

"We're in luck," he said. "We can go outside without protection, if the pathogenic tests are satisfactory. What did you make of the place as we came in, Bertrond?"

"Geologically stable-no active volcanoes, at least. I didn't see any trace of cities, but that proves nothing. If there's a civilization here, it may have passed that stage."

"Or not reached it yet?"

Bertrond shrugged. "Either's just as likely. It may take us some time to find out on a planet this size."

"More time than we've got," said Clindar, glancing at the communications panel that linked them to the mother ship and thence to the Galaxy's threatened heart. For a moment there was a gloomy silence. Then Clindar walked to the control board and pressed a pattern of keys with automatic skill.

With a slight jar, a section of the hull slid aside and the fourth member of the crew stepped out onto the new planet, flexing metal limbs and adjusting servo motors to the unaccustomed gravity. Inside the ship, a television screen glimmered into life, revealing a long vista of waving grasses, some trees in the middle distance, and a glimpse of the great river. Clindar punched a button, and the picture flowed steadily across the screen as the robot turned its head.

"Which way shall we go?" Clindar asked.

"Let's have a look at those trees," Altman replied. "If there's any animal life we'll find it there."

"Look!" cried Bertrond. "A bird!"

Clindar's fingers flew over the keyboard: the picture centered on the tiny speck that had suddenly appeared on the left of the screen, and expanded rapidly as the robot's telephoto lens came into action.

"You're right," he said. "Feathers-beak-well up the evolutionary ladder. This place looks promising. I'll start the camera."

The swaying motion of the picture as the robot walked forward did not distract them: they had grown accustomed to it long ago. But they had never become reconciled to this exploration by proxy when all their impulses cried out to them to leave the ship, to run through the grass and to feel the wind blowing against their faces. Yet it was too great a risk to take, even on a world that seemed as fair as this. There was always a skull hidden behind Nature's most smiling face. Wild beasts, poisonous reptiles, quagmires-death could come to the unwary explorer in a thousand disguises. And worst of all were the invisible enemies, the bacteria and viruses against which the only defense might often be a thousand light years away.

A robot could laugh at all these dangers and even if, as sometimes happened, it encountered a beast powerful enough to destroy it-well, machines could always be replaced.

They met nothing on the walk across the grasslands. If any small animals were disturbed by the robot's passage, they kept outside its field of vision. Clindar slowed the machine as it approached the trees, and the watchers in the spaceship flinched involuntarily at the branches that appeared to slash across their eyes. The picture dimmed for a moment before the controls readjusted themselves to the weaker illumination; then it came back to normal.

The forest was full of life. It lurked in the undergrowth, clambered among the branches, flew through the air. It Red chattering and gibbering through the trees as the robot advanced. And all the while the automatic cameras were recording the pictures that formed on the screen, gathering material for the biologists to analyze when the ship returned to base.

Clindar breathed a sigh of relief when the trees suddenly thinned. It was exhausting work, keeping the robot from smashing into obstacles as it moved through the forest, but on open ground it could take care of itself. Th6n the picture trembled as if beneath a hammer-blow, there was a grinding metallic thud, and the whole scene swept vertiginously upward as the robot toppled and fell.

"What's that?" cried Altman. "Did you trip?"

"No," said Clindar grimly, his fingers flying over the keyboard.

"Something attacked from the rear. I hope . . . ah . . . I've still got control."

He brought the robot to a sitting position and swiveled its head. it did not take long to find the cause of the trouble. Standing a few feet away, and lashing its tail angrily, was a large quadruped with a most ferocious set of teeth. At the moment it was, fairly obviously, trying to decide whether to attack again.

Slowly, the robot rose to its feet, and as it did so the great beast crouched to spring. A smile flitted across Clindar's face: he knew how to deal with this situation, His thumb felt for the seldom-used key labeled "Siren."

The forest echoed with a hideous undulating scream from the robot's concealed speaker, and the machine advanced to meet its adversary, arms flailing in front of it. The startled beast almost fell over backward in its effort to turn, and in seconds was gone from sight.

"Now I suppose well have to wait a couple of hours until everything comes out of hiding again," said Bertrond ruefully.

"I don't know much about animal psychology," interjected Altman, "but is it usual for them to attack something completely unfamiliar?"

"Some will attack anything that moves, but that's unusual. Normally they attack only for food, or if they've already been threatened. What are you driving at? Do you suggest that there are other robots on this planet?"

"Certainly not. But our carnivorous friend may have mistaken our machine for a more edible biped. Don't you think that this opening in the jungle is rather unnatural? It could easily be a path."

"In that case," said Clindar promptly, "we'll follow it and find out. I'm tired of dodging trees, but I hope nothing jumps on us again: it's bad for my nerves."
"You were right, Altman," said Bertrond a little later. "It's certainly a path. But that doesn't mean intelligence. After all, animals-,,
He stopped in mid-sentence, and at the same instant Clindar brought the advancing robot to a halt. The path had suddenly opened out into a wide clearing, almost completely occupied by a village of flimsy huts. It was ringed by a wooden palisade, obviously defense against an enemy who at the moment presented no threat.

For the gates were wide open, and beyond them the inhabitants were going peacefully about their ways.
For many minutes the three explorers stared in silence at the screen. Then Clindar shivered a little and remarked: "It's uncanny. It might be our own planet, a hundred thousand years ago. I feel as if I've gone back in time."
"There's nothing weird about it," said the practical Altman. "After all, we've discovered nearly a hundred planets with our type of life on them."
"Yes," retorted Clindar. "A hundred in the whole Galaxy! I still think it's strange it had to happen to us."
"Well, it had to happen to somebody," said Bertrond philosophically. "Meanwhile, we must work out our contact procedure. If we send the robot into the village it will start a panic."
"That," said Altman, "is a masterly understatement. What we'll have to do is catch a native by himself and prove that we're friendly. Hide the robot, Clindar. Somewhere in the woods where it can watch the village without being spotted. We've a week's practical anthropology ahead of us!"
It was three days before the biological tests showed that it would be safe to leave the ship. Even then Bertrond insisted on going alone-alone, that is, if one ignored the substantial company of the robot. With such an ally he was not afraid of this planet's larger beasts, and his body's natural defenses could take care of the microorganisms. So, at least, the analyzers had assured him; and considering the complexity of the problem, they made remarkably few mistakes . . .
He stayed outside for an hour, enjoying himself cautiously, while his companions watched with envy. It would be another three days before they could be quite certain that it was safe to follow Bertrond's example. Meanwhile, they kept busy enough watching the village through the lenses of the robot, and recording everything they could with the cameras. They had moved the spaceship at night so that it was hidden in the depths of the forest, for they did not wish to be discovered until they were ready.
And all the while the news from home grew worse. Though their remoteness here at the edge of the Universe deadened its impact, it lay heavily on their minds and sometimes overwhelmed them with a sense of futility. At any moment, they knew, the signal
for recall might come as the Empire summoned up its last resources in its extremity. But until then they would continue their work as though pure knowledge were the only thing that mattered.
Seven days after landing, they were ready to make the experiment. They knew now what paths the villagers used when going hunting, and Bertrond chose one of the less frequented ways. Then he placed a chair firmly in the middle of the path and settled down to read a book.
It was not, of course, quite as simple as that: Bertrond had taken-all imaginable precautions. Hidden in the undergrowth fifty yards away, the robot was watching through its telescopic lenses, and in its hand it held a small but deadly weapon. Controlling it from the spaceship, his fingers poised over the keyboard, Clindar waited to do what might be necessary.
That was the negative side of the plan: the positive side was more obvious. Lying at Bertrond's feet was the carcass of a small, homed animal which he hoped would be an acceptable gift to any hunter passing this way.
Two hours later the radio in his suit harness whispered a warning. Quite calmly, though the blood was pounding in his veins, Bertrond laid aside his book and looked

down the trail. The savage was walking forward confidently enough, swinging a spear in his right hand. He paused for a moment when he saw Bertrond, then advanced more cautiously. He could tell that there was nothing to fear, for the stranger was slightly built and obviously unarmed.
When only twenty feet separated them, Bertrond gave a reassuring smile and rose slowly to his feet. He bent down, picked up the carcass, and carried it forward as an offering. The gesture would have been understood by any creature on any world, and it was understood here. The savage reached forward, took the animal, and threw it effortlessly over his shoulder. For an instant he stared into Bertrond's eyes with a fathomless expression; then he turned and walked back toward the village. Three times he glanced round to see if Bertrond was following, and each time Bertrond smiled and waved reassurance. The whole episode lasted little more than a minute. As the first contact between two races it was completely without drama, though not without dignity.

Bertrond did not move until the other had vanished from sight. Then he relaxed and spoke into his suit microphone.
"That was a pretty good beginning," he said jubilantly. "He wasn't in the least frightened, or even suspicious. I think he'll be back."
"It still seems too good to be true," said Altman's voice in his ear. "I should have thought he'd have been either scared or hostile. Would you have accepted a lavish gift from a peculiar stranger with such little fuss?"
Bertrond was slowly walking back to the ship. The robot had now come out of cover and was keeping guard a few paces behind him.
"I wouldn't," he replied, "but I belong to a civilized community. Complete savages may react to strangers in many different ways, according to their past experience. Suppose this tribe has never had any enemies. That's quite possible on a large but sparsely populated planet. Then we may expect curiosity, but no fear at all."
"If these people have no enemies," put in Clindar, no longer fully occupied in controlling the robot, "why have they got a stockade round the village?"
"I meant no human enemies," replied Bertrond. "If that's true, it simplifies our task immensely."
"Do you think he'll come back?"
"Of course. If he's as human as I think, curiosity and greed will make him return. In a couple of days we'll be bosom friends."
Looked at dispassionately, it became a fantastic routine. Every morning the robot would go hunting under Clindar's direction, until it was now the deadliest killer in the jungle. Then Bertrond would wait until Yaan-which was the nearest they could get to his name-came striding confidently along the path. He came at the same time every day, and he always came alone. They wondered about this: did he wish to keep his great discovery to himself and thus get all the credit for his hunting prowess? If so, it showed unexpected foresight and cunning.
At first Yaan had departed at once with his prize, as if afraid that the donor of such a generous gift might change his mind. Soon, however, as Bertrond had hoped, he could be induced to stay for a while by simple conjuring tricks and a display of brightly colored fabrics and crystals, in which he took a childlike delight. At last
Bertrond was able to engage him in lengthy conversations, all of which were recorded as well as being filmed through the eyes of the hidden robot.
one day the philologists might be able to analyze this material; the best that Bertrond could do was to discover the meanings of a few simple verbs and nouns. This was made more difficult by the fact that Yaan not only used different words for the same thing, but sometimes the same word for different things.
Between these daily interviews, the ship traveled far, surveying the planet from the air and sometimes landing for more detailed examinations. Although several other human settlements were observed, Bertrond made no attempt to get in touch with them, for it was easy to see that they were all at much the same cultural level as Yaan's people.

it was, Bertrond often thought, a particularly bad joke on the part of Fate that one of the Galaxy's very few truly human races should have been discovered at this moment of time. Not long ago this would have been an event of supreme importance; now civilization was too hard-pressed to concern itself with these savage cousins waiting at the dawn of history.

Not until Bertrond was sure he had become part of Yaan's everyday life did he introduce him to the robot. He was showing Yaan the patterns in a kaleidoscope when Clindar brought the machine striding through the grass with its latest victim dangling across one metal arm. For the first time Yaan showed something akin to fear; but he relaxed at Bertrond's soothing words, though he continued to watch the advancing monster. It halted some distance away, and Bertrond walked forward to meet it. As he did so, the robot raised its arms and handed him the dead beast. He took it solemnly and carried it back to Yaan, staggering a little under the unaccustomed load.

Bertrond would have given a great deal to know just what Yaan was thinking as he accepted the gift. Was he trying to decide whether the robot was master or slave? Perhaps such conceptions as this were beyond his grasp: to him the robot might be merely another man, a hunter who was a friend of Bertrond.

Clindar's voice, slightly larger than life, came from the robot's speaker.

"It's astonishing how calmly he accepts us. Won't anything scare him?"

"You will keep judging him by your own standards," replied Bertrond. "Remember, his psychology is completely different, and much simpler. Now that he has confidence in me, anything that I accept won't worry him."

"I wonder if that will be true of all his race?" queried Altman. "It's hardly safe to judge by a single specimen. I want to see what happens when we send the robot into the village."

"Hello!" exclaimed Bertrond. "That surprised him. He's never met a person who could speak with two voices before."

"Do you think he'll guess the truth when he meets us?" said Clindar.

"No. The robot will be pure magic to him-but it won't be any more wonderful than fire and lightning and all the other forces he must already take for granted."

"Well, what's the next move?" asked Altman, a little impatiently. "Are you going to bring him to the ship, or will you go into the village first?"

Bertrond hesitated. "I'm anxious not to do too much too quickly. You know the accidents that have happened with strange races when that's been tried. I'll let him think this over, and when we get back tomorrow I'll try to persuade him to take the robot back to the village."

In the hidden ship, Clindar reactivated the robot and started it moving again. Like Altman, he was growing a little impatient of this excessive caution, but on all matters relating to alien life-forms Bertrond was the expert, and they had to obey his orders.

There were times now when he almost wished he were a robot himself, devoid of feelings or emotions, able to watch the fall of a leaf or the death agonies of a world with equal detachment . . .

The sun was low when Yaan heard the great voice crying from the jungle. He recognized it at once, despite its inhuman volume: it was the voice of his friend, and it was calling him.

In the echoing silence, the life of the village came to a stop. Even the children ceased their play: the only sound was the thin cry of a baby frightened by the sudden silence.

All eyes were upon Yaan as he walked swiftly to his hut and grasped the spear that lay beside the entrance. The stockade would soon be closed against the prowlers of the night, but he did not hesitate as he stepped out into the lengthening shadows. He was passing through the gates when once again that mighty voice summoned him, and now it held a note of urgency that came clearly across all the barriers of language and culture.

The shining giant who spoke with many voices met him a little way from the village and beckoned him to follow. There was no sign of Bertrond. They walked for almost a

mile before they saw him in the distance, standing not far from the river's edge and staring out across the dark, slowly moving waters.

He turned as Yaan approached, yet for a moment seemed unaware of his presence. Then he gave a gesture of dismissal to the shining one, who withdrew into the distance.

Yaan waited. He was patient and, though he could never have expressed it in words, contented. When he was with Bertrond he felt the first intimations of that selfless, utterly irrational devotion his race would not fully achieve for many ages.

It was a strange tableau. Here at the river's brink two men were standing. One was dressed in a closely-fitting uniform equipped with tiny, intricate mechanisms. The other was wearing the skin of an animal and was carrying a flint-tipped spear. Ten thousand generations lay between them, ten thousand generations and an immeasurable gulf of space. Yet they were both human. As she must do often in eternity, Nature had repeated one of her basic patterns.

Presently Bertrond began to speak, walking to and fro in short, quick steps as he did, and in his voice there was a trace of madness.

"It's all over, Yaan. I'd hoped that with our knowledge we could have brought you out of barbarism in a dozen generations, but now you will have to fight your way up from the jungle alone, and it may take you a million years to do so. I'm sorry-there's so much we could have done. Even now I wanted to stay here, but Altman and Clindar talk of duty, and I suppose that they are right. There is little enough that we can do, but our world is calling and we must not forsake it.

"I wish you could understand me, Yaan. I wish you knew what was saying. I'm leaving you these tools: some of them you will discover how to use, though as likely as not in a generation they'll be lost or forgotten. See how this blade cuts: it will be ages before

your world can make its like. And guard this well: when you press the button-look! If you use it sparingly, it will give you light for years, though sooner or later it will die. As for these other things find what use for them you can.

"Here come the first stars, up there in the east. Do you ever look at the stars, Yaan? I wonder how long it will be before you have discovered what they are, and I wonder what will have happened to us by then. Those stars are our homes, Yaan, and we cannot save them. Many have died already, in explosions so vast that I can imagine them no more than you. In a hundred thousand of your years, the light of those funeral pyres will reach your world and set its peoples wondering. By then, perhaps, your race will be reaching for the stars. I wish I could warn you against the mistakes we made, and which now will cost us all that we have won.

"It is well for your people, Yaan, that your world is here at the frontier of the Universe. You may escape the doom that waits for us. One day, perhaps, your ships will go searching among the stars as we have done, and they may come upon the ruins of our worlds and wonder who we were. But they will never know that we met here by this river when your race was young.

"Here come my friends; they would give me no more time. Good-by, Yaan-use well the things I have left you. They are your world's greatest treasures."

Something huge, something that glittered in the starlight, was sliding down from the sky. It did not reach the ground, but came to rest a little way above the surface, and in utter silence a rectangle of light opened in its side. The shining giant appeared out of the night and stepped through the golden door. Bertrond followed, pausing for a moment at the threshold to wave back at Yaan. Then the darkness closed behind him.

No more swiftly than smoke drifts upward from a fire, the ship lifted away. When it was so small that Yaan felt he could hold it in his hands, it seemed to blur into a long line of light slanting upward into the stars. From the empty sky a peal of thunder echoed over the sleeping land; and Yaan knew at last that the gods were gone and would never come again.

For a long time he stood by the gently moving waters, and into his soul there came a sense of loss he was never to forget and never

to understand. Then, carefully and reverently, he collected together the gifts that Bertrond had left.

Under the stars, the lonely figure walked homeward across a nameless land. Behind him the river flowed softly to the sea, winding through the fertile plains on which, more than a thousand centuries ahead, Yaan's descendants would build the great city they were to call Babylon.

Hide and Seek

Arthur C. Clarke

We were walking back through the woods when Kingman saw the gray squirrel. Our bag was a small but varied one -three grouse, four rabbits (one, I am sorry to say, an infant in arms) and a couple of pigeons. And contrary to certain dark forecasts, both the dogs were still alive.

The squirrel saw us at the same moment. It knew that it was marked for immediate execution as a result of the damage it had done to the trees on the estate, and perhaps it had lost close relatives to Kingman's gun. In three leaps it had reached the base of the nearest tree, and vanished behind it in a flicker of gray. We saw its face once more, appearing for a moment round the edge of its shield a dozen feet from the ground; but though we waited, with guns leveled hopefully at various branches, we never saw it again.

Kingman was very thoughtful as we walked back across the lawn to the magnificent old house. He said nothing as we handed our victims to the cook-who received them without much enthusiasm-and only emerged from his reverie when we were sitting in the smoking room and he remembered his duties as a host.

"That tree-rat," he said suddenly (he always called them "tree rats," on the grounds that people were too sentimental to shoot the dear little squirrels), "it reminded me of a very peculiar experience that happened shortly before I retired. Very shortly indeed, in fact."

"I thought it would," said Carson dryly. I gave him a glare: he'd been in the Navy and had heard Kingman's stories before, but they Were still new to me.

"Of course," Kingman remarked, slightly nettled, "if you'd rather I didn't . . . "

"Do go on," I said hastily. "You've made me curious. What connection there can possibly be between a gray squirrel and the Second Jovian War I can't imagine."

Kingman seemed mollified.

"I think I'd better change some names," he said thoughtfully, "but I won't alter the places. The story begins about a million kilometers sunward of Mars . . ."

K.15 was a military intelligence operative. It gave him considerable pain when unimaginative people called him a spy, but at the moment he had much more substantial grounds for complaint. For some days now a fast enemy cruiser had been coming up astern, and though it was flattering to have the undivided attention of such a fine ship and so many highly trained men, it was an honor that K.15 would willingly have forgone.

What made the situation doubly annoying was the fact that his friends would be meeting him off Mars in about twelve hours, aboard a ship quite capable of dealing with a mere cruiser-from which you will gather that K.15 was a person of some importance. Unfortunately, the most optimistic calculation showed that the pursuers would be within accurate gun range in six hours. In some six hours five minutes, therefore, K. 15 was likely to occupy an extensive and still expanding volume of space.

There might just be time for him to land on Mars, but that would be one of the worst things he could do. It would certainly annoy the aggressively neutral Martians, and the political complications would be frightful. Moreover, if his friends had to come down to the planet to rescue him, it would cost them more than ten kilometers a second in fuel-most of their operational reserve.

He had only one advantage, and that a very dubious one. The commander of the cruiser might guess that he was heading for a rendezvous, but he would not know how close it was or how large was the ship that was coming to meet him. If he could keep alive for only twelve hours, he would be safe. The "if" was a somewhat considerable one.

K.15 looked moodily at his charts, wondering if it was worthwhile to burn the rest of his fuel in a final dash. But a dash to where? He would be completely helpless then, and the pursuing ship might still have enough in her tanks to catch him as he flashed
outward into the empty darkness, beyond all hope of rescue-passing his friends as they came sunward at a relative speed so great that they could do nothing to save him.

With some people, the shorter the expectation of life, the more sluggish are the mental processes. They seem hypnotized by the approach of death, so resigned to their fate that they do nothing to avoid it. K.15, on the other hand, found that his mind worked better in such a desperate emergency. It began to work now as it had seldom done before.

Commander Smith-the name will do as well as any other-of the cruiser Doradus was not unduly surprised when K.15 began to decelerate. He had half expected the spy to land on Mars, on the principle that internment was better than annihilation, but when the plotting room brought the news that the little scout ship was heading for Phobos, he felt completely baffled. The inner moon was nothing but a jumble of rock some twenty kilometers across, and not even the economical Martians had ever found any use for it. K.15 must be pretty desperate if he thought it was going to be of any greater value to him.

The tiny scout had almost come to rest when the radar operator lost it against the mass of Phobos. During the braking maneuver, K.15 had squandered most of his lead and the Doradus was now only minutes away-though she was now beginning to decelerate lest she overrun him. The cruiser was scarcely three thousand kilometers from Phobos when she came to a complete halt: of K.15's ship, there was still no sign. It should be easily visible in the telescopes, but it was probably on the far side of the little moon.

It reappeared only a few minutes later, traveling under full thrust on a course directly away from the sun. It was accelerating at almost five gravities-and it had broken its radio silence. An automatic recorder was broadcasting over and over again this interesting message:

"I have landed on Phobos and am being attacked by a Z-class cruiser. Think I can hold out until you come, but hurry."

The message wasn't even in code, and it left Commander Smith a sorely puzzled man. The assumption that K.15 was still aboard the ship and that the whole thing was a ruse was just a little too naive. But it might be a double-bluff: the message bad obviously been left in plain language so that he would receive it and be duly

confused. He could afford neither the time nor the fuel to chase the scout if K. 15 really had landed. It was clear that reinforcements were on the way, and the sooner he left the vicinity the better. The phrase "Think I can hold out until you come" might be a piece of sheer impertinence, or it might mean that help was very near indeed.

Then K.15's ship stopped blasting. It had obviously exhausted its fuel, and was doing a little better than six kilometers a second away from the sun. K.15 must have landed, for his ship was now speeding helplessly out of the solar system. Commander Smith didn't like the message it was broadcasting, and guessed that it was running into the track of an approaching warship at some indefinite distance, but there was nothing to be done about that. The Doradus began to move toward Phobos, anxious to waste no time.

On the face of it, Commander Smith seemed the master of the situation. His ship was armed with a dozen heavy guided missiles and two turrets of electro-magnetic guns. Against him was one man in a space-suit, trapped on a moon only twenty kilometers across. It was not until Commander Smith had his first good look at Phobos, from a distance of less than a hundred kilometers, that he began to realize that, after all, K. 15 might have a few cards up his sleeve.

To say that Phobos has a diameter of twenty kilometers, as the astronomy books invariably do, is highly misleading. The word "diameter" implies a degree of symmetry which Phobos most certainly lacks. Like those other lumps of cosmic slag,

the asteroids, it is a shapeless mass of rock floating in space with, of course, no hint of an atmosphere and not much more gravity. It turns on its axis once every seven hours thirty-nine minutes, thus keeping the same face always to Mars-which is so close that appreciably less than half the planet is visible, the poles being below the curve of the horizon. Beyond this, there is very little more to be said about Phobos.

K. 15 had no time to enjoy the beauty of the crescent world filling the sky above him. He had thrown all the equipment he could carry out of the airlock, set the controls, and jumped. As the little ship went flaming out toward the stars he watched it go with feelings he did not care to analyze. He had burned his boats with a vengeance, and he could only hope that the oncoming battleship would intercept the radio message as the empty vessel went racing
by into nothingness. There was also a faint possibility that the enemy cruiser might 90 in pursuit, but that was rather too much to hope for.

He turned to examine his new home. The only light was the ocher radiance of Mars, since the sun was below the horizon, but that was quite sufficient for his purpose and he could see very well. He stood in the center of an irregular plain about two kilometers across, surrounded by low hills over which he could leap rather easily if he wished. There was a story he remembered reading long ago about a man who had accidentally jumped off Phobos: that wasn't quite possible-though it was on Deimos-as the escape velocity was still about ten meters a second. But unless he was careful, he might easily find himself at such a height that it would take hours to fall back to the surface-and that would be fatal. For K. 15's plan was a simple one: he must remain as close to the surface of Phobos as possible-and diametrically opposite the cruiser. The Doradus could then fire all her armament against the twenty kilometers of rock, and he wouldn't even feel the concussion. There were only two serious dangers, and one of these did not worry him greatly.

To the layman, knowing nothing of the finer details of astronautics, the plan would have seemed quite suicidal. The Doradus was armed with the latest in ultra-scientific weapons: moreover, the twenty kilometers which separated her from her prey represented less than a second's flight at maximum speed. But Commander Smith knew better, and was already feeling rather unhappy. He realized, only too well, that of all the machines of transport man has ever invented, a cruiser of space is far and away the least maneuverable. It was a simple fact that K. 15 could make half a dozen circuits of his little world while her commander was persuading the Doradus to make even one.

There is no need to go into technical details, but those who are still unconvinced might like to consider these elementary facts. A rocket-driven spaceship can, obviously, only accelerate along its major axis-that is, "forward." Any deviation from a straight course demands a physical turning of the ship, so that the motors can blast in another direction. Everyone knows that this is done by internal gyros or tangential steering jets, but very few people know just how long this simple maneuver takes. The average cruiser, fully fueled,

has a mass of two or three thousand tons, which does not make for rapid footwork. But things are even worse than this, for it isn't the mass, but the moment of inertia that matters here-and since a cruiser is a long, thin object, its moment of inertia is slightly colossal. The sad fact remains (though it is seldom mentioned by astronautical engineers) that it takes a good ten minutes to rotate a spaceship through 180 degrees, with gyros of any reasonable size. Control jets aren't much quicker, and in any case their use is restricted because the rotation they produce is permanent and they are liable to leave the ship spinning like a slow-motion pinwheel, to the annoyance of all inside.

In the ordinary way, these disadvantages are not very grave. One has millions of kilometers and hundreds of hours in which to deal with such minor matters as a change in the ship's orientation. It is definitely against the rules to move in ten-kilometer radius circles, and the commander of the Doradus felt distinctly aggrieved, K. 15 wasn't playing fair.

At the same moment that resourceful individual was taking stock of the situation, which might very well have been worse. He had reached the hills in three jumps and felt less naked than he had out in the open plain. The food and equipment he had taken from the ship he had hidden where he hoped he could find it again, but as his suit could keep him alive for over a day that was the least of his worries. The small packet that was the cause of all the trouble was still with him, in one of those numerous hiding places a well-designed space-suit affords.

There was an exhilarating loneliness about his mountain eyrie, even though he was not quite as lonely as he would have wished. Forever fixed in his sky, Mars was waning almost visibly as Phobos swept above the night side of the planet. He could just make out the lights of some of the Martian cities, gleaming pin-points marking the junctions of the invisible canals. All else was stars and silence and a line of jagged peaks so close it seemed he could almost touch them. Of the Doradus there was still no sign. She was
presumably carrying out a careful telescopic examination of the Le: lighted side of Phobos.

Mars was a very useful clock: when it was half full the sun would rise and, very probably, so would the Doradus. But she might approach from some quite unexpected quarter: she might
even-and this was the one real danger-she might even have landed a search party. This was the first possibility that had occurred to Commander Smith when he saw just what he was up against. Then he realized that the surface area of Phobos was over a thousand square kilometers and that he could not spare more than ten men from his crew to make a search of that jumbled wilderness. Also, K. 15 would certainly be armed.

Considering the weapons which the Doradus carried, this last objection might seem singularly pointless. It was very far from being so. In the ordinary course of business, side-arms and other portable weapons are as much use to a space-cruiser as are cutlasses and crossbows. The Doradus happened, quite by chance-and against regulations at that-to carry one automatic pistol and a hundred rounds of ammunition. Any search party would therefore consist of a group of unarmed men looking for a well concealed and very desperate individual who could pick them off at his leisure. K.15 was breaking the rules again.

The terminator of Mars was now a perfectly straight line, and at almost the same moment the sun came up, not so much like thunder as like a salvo of atomic bombs. K.15 adjusted the filters of his visor and decided to move. It was safer to stay out of the sunlight, not only because here he was less likely to be detected in the shadow but also because his eyes would be much more sensitive there. He had only a pair of binoculars to help him, whereas the Doradus would carry an electronic telescope of twenty centimeters aperture at least.

It would be best, K. 15 decided, to locate the cruiser if he could. It might be a rash thing to do, but he would feel much happier when he knew exactly where she was and could watch her movements. He could then keep just below the horizon, and the glare of the rockets would give him ample warning of any impending move. Cautiously launching himself along an almost horizontal trajectory, he began the circumnavigation of his world.

The narrowing crescent of Mars sank below the horizon until only one vast horn reared itself enigmatically against the stars. K. 15 began to feel worried: there was still no sign of the Doradus. But this was hardly surprising, for she was painted black as night and might be a good hundred kilometers away in space. He stopped,

wondering if he had done the right thing after all. Then he noticed that something quite large was eclipsing the stars almost vertically overhead, and was moving swiftly even as he watched. His heart stopped for a moment: then he was himself again, analyzing the situation and trying to discover how he had made so disastrous a mistake.

It was some time before he realized that the black shadow slip)ping across the sky was not the cruiser at all, but something almost equally deadly. It was far

smaller, and far nearer, than he had at first thought. The Doradus had sent her television-homing guided missiles to look for him-

This was the second danger he had feared, and there was nothing he could do about it except to remain as inconspicuous as possible. The Doradus now had many eyes searching for him, but these auxiliaries had very severe limitations. They had been built to look for sunlit spaceships against a background of stars, not to search for a man hiding in a dark jungle of rock. The definition of their television systems was low, and they could only see in the forward direction.

There were rather more men on the chessboard now, and the game was a little deadlier, but his was still the advantage.

The torpedo vanished into the night sky. As it was traveling on a nearly straight course in this low gravitational field, it would soon be leaving Phobos behind, and K. 15 waited for what he knew must happen. A few minutes later, he saw a brief stabbing of rocket exhausts and guessed that the projectile was swinging slowly back on its course. At almost the same moment he saw another flare far away in the opposite quarter of the sky, and wondered just how many of these infernal machines were in action. From what he knew of Z-class cruisers-which was a good deal more than he should there were four missile-control channels, and they were probably all in use.

He was suddenly struck by an idea so brilliant that he was quite sure it couldn't possibly work. The radio on his suit was a tunable one, covering an unusually wide band, and somewhere not far away the Doradus was pumping out power on everything from a thousand megacycles upward. He switched on the receiver and began to explore.

It came in quickly-the raucous whine of a pulse transmitter
not far away. He was probably only picking up a sub-harmonic, but that was quite good enough. It D/F'ed sharply, and for the first time K.15 allowed himself to make long-range plans about the future. The Doradus had betrayed herself: as long as she operated her missiles, he would know exactly where she was.

He moved cautiously forward toward the transmitter. To his surprise the signal faded, then increased sharply again. This puzzled him until he realized that he must be moving through a diffraction zone. its width might have told him something useful if he had been a good enough physicist, but he couldn't imagine what.

The Doradus was hanging about five kilometers above the surface, in full sunlight. Her "non-reflecting" paint was overdue for renewal, and K.15 could see her clearly. As he was still in darkness, and the shadow line was moving away from him, he decided that he was as safe here as anywhere. He settled down comfortably so that he could just see the cruiser and waited, feeling fairly certain that none of the guided projectiles would come so near the ship. By now, he calculated, the commander of the Doradus must be getting pretty mad. He was perfectly correct.

After an hour, the cruiser began to heave herself round with all the grace of a bogged hippopotamus. K. 15 guessed what was happening. Commander Smith was going to have a look at the antipodes, and was preparing for the perilous fifty-kilometer journey. He watched very carefully to see the orientation the ship was adopting, and when she came to rest again was relieved to see that she was almost broadside on to him. Then, with a series of jerks that could not have been very enjoyable aboard, the cruiser began to move down to the horizon. K. 15 followed her at a comfortable walking pace-if one could use the phrase-reflecting that this was a feat very few people had ever performed. He was particularly careful not to overtake her on one of his kilometer-long glides, and kept a close watch for any missiles that might be coming up astern.

It took the Doradus nearly an hour to cover the fifty kilometers. This, as K. 15 amused himself by calculating, represented considerably less than a thousandth of her normal speed. Once she found herself going off into space at a tangent, and rather than waste time turning end over end again fired off a salvo of shells to reduce speed. But she made it at last, and K.15 settled down for another

vigil, wedged between two rocks where he could just see the cruiser and he was quite sure she couldn't see him. It occurred to him that by this time Commander

Smith might have grave doubts as to whether he really was on Phobos at all, and he felt like firing off a signal flare to reassure him. However, he resisted the temptation.

There would be little point in describing the events of the next ten hours, since they differed in no important detail from those that had gone before. The Doradus made three other moves, and K.15 stalked her with the care of a big-game hunter following the spoor of some elephantine beast. Once, when she would have led him out into full sunlight, he let her fall below the horizon until he could only just pick up her signals. But most of the time he kept her just visible, usually low down behind some convenient hill.

Once a torpedo exploded some kilometers away, and K. 15 guessed that some exasperated operator had seen a shadow he didn't like-or else that a technician had forgotten to switch off a proximity fuse. Otherwise nothing happened to enliven the proceedings: in fact, the whole affair was becoming rather boring. He almost welcomed the sight of an occasional guided missile drifting inquisitively overhead, for he did not believe that they could see him if he remained motionless and in reasonable cover. If he could have stayed on the part of Phobos exactly opposite the cruiser he would have been safe even from these, he realized, since the ship would have no control there in the moon's radio-shadow. But he could think of no reliable way in which he could be sure of staying in the safety zone if the cruiser moved again.

The end came very abruptly. There was a sudden blast of steering jets, and the cruiser's main drive burst forth in all its power and splendor. In seconds the Doradus was shrinking sunward, free at last, thankful to leave, even in defeat, this miserable lump of rock that had so annoyingly balked her of her legitimate prey. K. 15 knew what had happened, and a great sense of peace and relaxation swept over him. In the radar room of the cruiser, someone had seen an echo of disconcerting amplitude approaching with altogether excessive speed. K.15 now had only to switch on his suit beacon and to wait. He could even afford the luxury of a cigarette.

"Quite an interesting story," I said, "and I see now how it ties up with that squirrel. But it does raise one or two queries in my mind."

"Indeed?" said Rupert Kingman politely.

I always like to get to the bottom of things, and I knew that my host had played a part in the Jovian War about which he very seldom spoke. I decided to risk a long shot in the dark.

"May I ask how you happen to know so much about this unorthodox military engagement? It isn't possible, is it, that you were K. 15?"

There was an odd sort of strangling noise from Carson. Then Kingman said, quite calmly: "No, I wasn't."

He got to his feet and went off toward the gun room.

"If you'll excuse me a moment, I'm going to have another shot at that tree-rat. Maybe I'll get him this time." Then he was gone.

Carson looked at me as if to say: "This is another house you'll never be invited to again." When our host was out of earshot he remarked in a coldly cynical voice: "You've done it. What did you have to say that for?"

"Well, it seemed a safe guess. How else could he have known all that?"

"As a matter of fact, I believe he met K. 15 after the War: they must have had an interesting conversation together. But I thought you knew that Rupert was retired from the service with only the rank of lieutenant commander. The Court of Inquiry could never see his point of view. After all, it just wasn't reasonable that the commander of the fastest ship in the Fleet couldn't catch a man in a

9ÍÁ…❷”µÍÕ¥Ð¸ˆ4

History Lesson

Arthur C. Clarke
1949 Better Publications Inc.

No one could remember when the tribe had begun its long journey. The land of great rolling plains that had been its first home was now no more than a half-forgotten dream.

For many years Shann and his people had been fleeing through a country of low hills and sparkling lakes, and now the mountains lay ahead. This summer they must cross them to the southern lands. There was little time to lose. The white terror that had come down from the Poles, grinding continents to dust and freezing the very air before it, was less than a day's march behind.

Shann wondered if the glaciers could climb the mountains ahead, and within his heart he dared to kindle a little flame of hope. This might prove a barrier against which even the remorseless ice would batter in vain. In the southern lands of which the legends spoke, his people might find refuge at last.

It took weeks to discover a pass through which the tribe and the animals could travel. When midsummer came, they had camped in a lonely valley where the air was thin and the stars shone with a brilliance no one had ever seen before.

The summer was waning when Shann took his two sons and went ahead to explore the way. For three days they climbed, and for three nights slept as best they could on the freezing rocks, and on the fourth morning there was nothing ahead but a gentle rise to a cairn of gray stones built by other travelers, centuries ago.

Shann felt himself trembling, and not with cold, as they walked toward the little pyramid of stones. His sons had fallen behind. No one spoke, for too much was at stake. In a little while they would know if all their hopes had been betrayed.

To east and west, the wall of mountains curved away as if embracing the land beneath. Below lay endless miles of undulating plain, with a great river swinging across it in tremendous loops. It was a fertile land; one in which the tribe could raise crops knowing that there would be no need to flee before the harvest came.

Then Shann lifted his eyes to the south, and saw the doom of all his hopes. For there at the edge of the world glimmered that deadly light he had seen so often to the north-the glint of ice below the horizon.

There was no way forward. Through all the years of flight, the glaciers from the south had been advancing to meet them. Soon they would be crushed beneath the moving walls of ice . . .

Southern glaciers did not reach the mountains until a generation later. In that last summer the sons of Shann carried the sacred treasures of the tribe to the lonely cairn overlooking the plain. The ice that had once gleamed below the horizon was now almost at their feet. By spring it would be splintering against the mountain walls.

No one understood the treasures now. They were from a past too distant for the understanding of any man alive. Their origins were lost in the mists that surrounded the Golden Age, and how they had come at last into the possession of this wandering tribe was a story that now would never be told. For it was the story of a civilization that had passed beyond recall.

Once, all these pitiful relics had been treasured for some good reason, and now they had become sacred though their meaning had long been lost. The print in the old books had faded centuries ago though much of the lettering was still visible-if there had been any to read it. But many generations had passed since anyone had had a use for a set of seven-figure logarithms, an atlas of the world, and the score of

Sibelius' Seventh Symphony printed, according to the flyleaf, by H. K. Chu and Sons, at the City of Pekin in the year 2371 A.D.

The old books were placed reverently in the little crypt that had been made to receive them. There followed a motley collection of fragments-gold and platinum coins, a broken telephoto lens, a watch, a cold-light lamp, a microphone, the cutter from an electric razor, some midget radio tubes, the flotsam that had been left behind when the great tide of civilization had ebbed forever.

All these treasures were carefully stowed away in their resting place. Then came three more relics, the most sacred of all because the least understood.
The first was a strangely shaped piece of metal, showing the coloration of intense heat. It was, in its way, the most pathetic of all these, symbols from the past, for it told of man's greatest achievement and of the future he might have known. The mahogany stand on which it was mounted bore a silver plate with the inscription:
Auxiliary Igniter from Starboard Jet Spaceship "Morning Star" Earth-Moon, A.D. 1985
Next followed another miracle of the ancient science-a sphere of transparent plastic with strangely shaped pieces of metal imbedded in it. At its center was a tiny capsule of synthetic radio element, surrounded by the converting screens that shifted its radiation far down the spectrum. As long as the material remained active, the sphere would be a tiny radio transmitter, broadcasting power in all directions. Only a few of these spheres had ever been made.-They had been designed as perpetual beacons to mark the orbits of the asteroids. But man had never reached the asteroids and the beacons had never been used.

Last of all was a flat, circular tin, wide in comparison with its depth. It was heavily sealed, and rattled when shaken. The tribal lore predicted that disaster would follow if it was ever opened, and no one knew that it held one of the great works of art of nearly a thousand years before.
The work was finished. The two men rolled the stones back into place and slowly began to descend the mountainside. Even to the last, man had given some thought to the future and had tried to preserve something for posterity.
That winter the great waves of ice began their first assault on the mountains, attacking from north and south. The foothills were overwhelmed in the first onslaught, and the glaciers ground them into dust. But the mountains stood firm, and)When the summer came the ice retreated for a while.
So, winter after winter, the battle continued, and the roar of the avalanches, the grinding of rock and the explosions of splintering ice filled the air with tumult. No war of man's had been fiercer than this, and even man's battles had not quite engulfed the globe as this had done.

At last the tidal waves of ice began to subside and to creep slowly down the flanks of the mountains they had never quite subdued. The valleys and passes were still firmly in their grip. It was stalemate. The glaciers had met their match, but their defeat was too late to be of any use to man.
So the centuries passed, and presently there happened something that must occur once at least in the history of every world in the universe, no matter how remote and lonely it may be.
The ship from Venus came five thousand years too late, but its crew knew nothing of this. While still many millions of miles away, the telescopes had seen the great shroud of ice that made Earth the most brilliant object in the sky next to the sun itself.

Here and there the dazzling sheet was marred by black specks that revealed the presence of almost buried mountains. That was all. The rolling oceans, the plains and forests, the deserts and lakes -all that had been the world of man was sealed beneath the ice, perhaps forever.

The ship closed in to Earth and established an orbit less than a thousand miles away. For five days it circled the planet, while cameras recorded all that was left to see and a hundred instruments gathered information that would give the Venusian scientists many years of work.

An actual landing was not intended. There seemed little purpose in it. But on the sixth day the picture changed. A panoramic monitor, driven to the limit of its amplification, detected the dying radiation of the five-thousand-year-old beacon. Through all the centuries, it had been sending out its signals with ever-failing strength as its radioactive heart steadily weakened.
The monitor locked on the beacon frequency. In the control room, a bell clamored for attention. A little later, the Venusian ship broke free from its orbit and slanted down toward Earth, toward a range of mountains that still towered proudly above the ice, and to a cairn of gray stones that the years had scarcely touched . . . .

The great disk of the sun blazed fiercely in a sky no longer veiled with mist, for the clouds that had once hidden Venus had now completely gone. Whatever force had caused the change in the sun's radiation had doomed one civilization, but had given birth to another. Less than five thousand years before, the half-savage people of Venus had seen sun and stars for the first time. Just as the science of Earth had begun with astronomy, so had that of Venus, and on the warm, rich world that man had never seen progress had been incredibly rapid.

Perhaps the Venusians had been lucky. They never knew the Dark Age that held man enchained for a thousand years. They missed the long detour into chemistry and mechanics but came at once to the more fundamental laws of radiation physics. In the time that man had taken to progress from the Pyramids to the rocket-propelled spaceship, the Venusians had passed from the discovery of agriculture to antigravity itself-the ultimate secret that man had never learned.
The warm ocean that still bore most of the young planet's life rolled its breakers languidly against the sandy shore. So new was this continent that the very sands were coarse and gritty. There had not yet been time enough for the sea to wear them smooth.

The scientists lay half in the water, their beautiful reptilian bodies gleaming in the sunlight. The greatest minds of Venus had gathered on this shore from all the islands of the planet. What they were going to hear they did not know, except that it concerned the Third World and the mysterious race that had peopled it before the coming of the ice.
. The Historian was standing on the land, for the instruments he wished to use had no love of water. By his side was a large machine which attracted many curious glances from his colleagues. It was clearly concerned with optics, for a lens system projected from it toward a screen of white material a dozen yards away.
The Historian began to speak. Briefly he recapitulated what little had been discovered concerning the Third Planet and its people.

He mentioned the centuries of fruitless research that had failed to interpret a single word of the writings of Earth. The planet had been inhabited by a race of great technical ability. That, at least, was proved by the few pieces of machinery that had been found in the cairn upon the mountain.

"We do not know why so advanced a civilization came to an end," he observed. "Almost certainly, it had sufficient knowledge to survive an ice Age. There must have been some other factor of which we know nothing. Possibly disease or racial degeneration may have been responsible. It has even been suggested that the tribal conflicts endemic to our own species in prehistoric times may have continued on the Third Planet after the coming of technology.

"Some philosophers maintain that knowledge of machinery does not necessarily imply a high degree of civilization, and it is theoretically possible to have wars in a society possessing mechanical power, flight, and even radio. Such a conception is alien to our thoughts, but we must admit its possibility. It would certainly account for the downfall of the lost race.
"it has always been assumed that we should never know anything of the physical form of the creatures who lived on Planet Three. For centuries our artists have been depicting scenes from the history of the dead world, peopling it with all manner of fantastic beings. Most of these creations have resembled us more or less closely, though it has often been pointed out that because we are reptiles it does not follow that all intelligent life must necessarily be reptilian.
"We now know the answer to one of the most baffling problems of history. At last, after hundreds of years of research, we have discovered the exact form and nature of the ruling life on the Third Planet."

There was a murmur of astonishment from the assembled scientists. Some were so taken aback that they disappeared for a while into the comfort of the ocean, as all Venusians were apt to do in moments of stress. The Historian waited until his colleagues reemerged into the element they so disliked. He himself was quite comfortable, thanks to the tiny sprays that were continually playing over his body. With their help he could live on land for many hours before having to return to the ocean.
The excitement slowly subsided and the lecturer continued:
"One of the most puzzling of the objects found on Planet Three was a flat metal container holding a great length of transparent plastic material, perforated at the edges and wound tightly into a spool. This transparent tape at first seemed quite featureless, but an examination with the new subelectronic microscope has shown that this is not the case. Along the surface of the material, invisible to our eyes but perfectly clear under the correct radiation, are literally thousands of tiny pictures. It is believed that they were imprinted on the material by some chemical means, and have faded with the passage of time.

"These pictures apparently form a record of life as it was on the Third Planet at the height of its civilization. They are not independent. Consecutive pictures are almost identical, differing only in the detail of movement. The purpose of such a record is obvious. It is only necessary to project the scenes in rapid succession to give an illusion of continuous movement. We have made a machine to do this, and I have here an exact reproduction of the picture sequence.
"The scenes you are now going to witness take us back many thousands of years, to the great days of our sister planet. They show a complex civilization, many of whose activities we can only dimly understand. Life seems to have been very violent and energetic, and much that you will see is quite baffling.

"It is clear that the Third Planet was inhabited by a number of different species, none of them reptilian. That is a blow to our pride, but the conclusion is inescapable. The dominant type of life appears to have been a two-armed biped. It walked upright and covered its body with some flexible material, possibly for protection against the cold, since even before the Ice Age the planet was at a much lower temperature than our own world. But I will not try your patience any further. You will now see the record of which I have been speaking."
A brilliant light flashed from the projector. There was a gentle whirring, and on the screen appeared hundreds of strange beings moving rather jerkily to and fro. The picture expanded to embrace one of the creatures, and the scientists could see that the Historian's description had been correct.
The creature possessed two eyes, set rather close together, but the other facial adornments were a little obscure. There was a large orifice in the lower portion of the head that was continually opening and closing. Possibly it had something to do with the creature's breathing.

The scientists watched spellbound as the strange being became involved in a series of fantastic adventures. There was an incredibly violent conflict with another, slightly different creature. It seemed
certain that they must both be killed, but when it was all over neither seemed any the worse.
Then came a furious drive over miles of country in a four wheeled mechanical device which was capable of extraordinary feats of locomotion. The ride ended in a city packed with other vehicles moving in all directions at breathtaking speeds. No one was surprised to see two of the machines meet head-on with devastating results.
After that, events became even more complicated. It was now quite obvious that it would take many years of research to analyze and understand all that was happening. It was also clear that the record was a work of art, somewhat stylized, rather than an exact reproduction of life as it actually had been on the Third Planet.

Most of the scientists felt themselves completely dazed when the sequence of pictures came to an end. There was a final flurry of motion, in which the creature that had been the center of interest became involved in some tremendous but incomprehensible catastrophe. The picture contracted to a circle, centered on the creature's head.
The last scene of all was an expanded view of its face, obviously expressing some powerful emotion. But whether it was rage, grief, defiance, resignation or some other feeling could not be guessed. The picture vanished. For a moment some lettering appeared on the screen, then it was all over.

For several minutes there was complete silence, save for the lapping of the waves upon the sand. The scientists were too stunned to speak. The fleeting glimpse of Earth's civilization had had a shattering effect on their minds. Then little groups began to start talking together, first in whispers and then more and more loudly as the implications of what they had seen became clearer. Presently the Historian called for attention and addressed the meeting again.
"We are now planning," he said, "a vast program of research to extract all available knowledge from this record. Thousands of copies are being made for distribution to all workers. You win appreciate the problems involved. The psychologists in particular have an immense task confronting them.

"But I do not doubt that we shall succeed. In another generation, who can say what we may not have learned of this wonderful race? Before we leave, let us look again at our remote cousins,

whose wisdom may have surpassed our own but of whom so little has survived."
Once more the final picture flashed on the screen, motionless this time, for the projector had been stopped. With something like awe, the scientists gazed at the stiff figure from the past, while in turn the little biped stared back at them with its characteristic expression of arrogant bad temper.

For the rest of time it would symbolize the human race. The psychologists of Venus would analyze its actions and watch its every movement until they could reconstruct its mind. Thousands of books would be written about it. Intricate philosophies would be contrived to account for its behavior.
But all. this labor, all this research, would be utterly in vain. Perhaps the proud and lonely figure on the screen was smiling sardonically at the scientists who were starting on their age-long fruitless quest.

Its secret would be safe as long as the universe endured, for no one now would ever read the lost language of Earth. Millions of times in the ages to come those last few words would flash across the screen, and none could ever guess their meaning:
.....A Walt Disney Production.

INHERITANCE

Arthur C. Clarke

As David said, when one falls on Africa from a height of two hundred and fifty kilometers, a broken ankle may be an anticlimax but it is none the less painful. But what hurt him most, he pretended, was the way we had all rushed out into the desert to see what had happened to the A.20 and hadn't come near him until hours later.

"Be logical, David," Jimmy Langford had protested. "We knew that you were O.K. because the base 'copter radioed when it picked you up. But the A.20 might have been a complete write-off."

"There's only one A.20," I said, trying to be helpful, "but rocket test-pilots are-well, if not two a penny, at any rate twelve for a dime."

David glared back at us from beneath his bushy eyebrows and said something in Welsh.

"The Druid's curse," Jimmy remarked to me. "Any moment now you'll turn into a leek or a perspex model of Stonehenge."

You see, we were still pretty light-headed and it wouldn't do to be serious for a while. Even David's iron nerve must have taken a terrific beating, yet somehow he seemed the calmest of us all. I couldn't understand it-then.

The A.20 had come down fifty kilometers from her launching point. We'd followed her by radar for the whole trajectory, so we knew her position to within a few meters-though we didn't know at the time that David had landed ten kilometers farther east.

The first warning of disaster had come seventy seconds after takeoff. The A.20 had reached fifty kilometers and was following the correct trajectory to within a few per cent. As far as the eye could tell, the luminous track on the radar screen had scarcely deviated from the pre-computed path. David was doing two kilometers a second: not much, but the fastest any man had ever traveled up to then. And Goliath was just about to be jettisoned.

The A.20 was a two-step rocket. It had to be, for it was using chemical fuels. The upper component, with its tiny cabin, its folded acrofoils and flaps, weighed just under twenty tons when fully fuelled. It was to be lifted by a lower two-hundred-ton booster -which would take it up to fifty kilometers, after which it could carry on quite happily under its own power. The big fellow would then drop back to Earth by parachute: it wouldn't weigh much when its fuel was burnt. Meanwhile the upper step would have built up enough speed to reach the six-hundred-kilometer level before falling back and going into a glide that would take David halfway round the world if he wished.

I don't remember who called the two rockets David and Goliath but the names caught on at once. Having two David's around caused a lot of confusion, not all of it accidental.

Well, that was the theory, but as we watched the tiny green spot on the screen fall away from its calculated course, we knew that something had gone wrong. And we guessed what it was.

At fifty kilometers the spot should have divided in two. The brighter echo should have continued to rise as a free projectile, and then fallen back to Earth. But the other should have gone on, still accelerating, drawing swiftly away from the discarded booster.

There had been no separation. The empty Goliath had refused to come free and was dragging David back to Earth-helplessly, for David's motors could not be used. Their exhausts were blocked by the machine beneath.

We saw all this in about ten seconds. We waited just long enough to calculate the new trajectory, and then we climbed into the copters and set off for the target area.
All we expected to find, of course, was a heap of magnesium looking as if a bulldozer had gone over it. We knew that Goliath couldn't eject its parachute while David was sitting on top of it, any more than David could use its motors while Goliath was clinging beneath. I remember wondering who was going to break the news to Mavis, and then realizing that she'd be listening to the radio and would know all about it as soon as anyone.

We could scarcely believe our eyes when we found the two rockets still coupled together, lying undamaged beneath the big parachute. There was no sign of David, but a few minutes later Base called to say that he'd been found. The plotters at Number Two Station had picked up the tiny echo from his parachute and sent a 'copter to collect him. He was in the hospital twenty minutes later, but we stayed out in the desert for several hours checking over the machines and making arrangements to retrieve them.
When at last we got back to Base, we were pleased to see our best-hated science-reporters among the mob being held at bay. We waved aside their protests and sailed on into the ward.
The shock and the subsequent relief had left us all feeling rather irresponsible and perhaps childish. Only David seemed unaffected: the fact that he'd just had one of the most miraculous escapes in human history hadn't made him turn a hair. He sat there in the bed pretending to be annoyed at our jibes until we'd calmed down.
"Well," said Jimmy at last, "what went wrong?"
"That's for you to discover," David replied. "Goliath went like a dream until fuel-cutoff point. I waited then for the five-second pause before the explosive bolts detonated and the springs threw it clear, but nothing happened. So I punched the emergency release. The lights dimmed, but the kick I'd expected never came. I tried a couple more times but somehow I knew it was useless. I guessed that something had shorted in the detonator circuit and was earthling the power supply.
"Well, I did some rather rapid calculations from the flight charts and abacs in the cabin. At my present speed I'd continue to rise for another two hundred kilometers and would reach the peak of my trajectory in about three minutes. Then I'd start the two-hundred and-fifty-kilometer fall and should make a nice hole in the desert four minutes later. All told, I seemed to have a good seven minutes of life left-ignoring air-resistance, to use your favorite phrase. That might add a couple of minutes to my expectation of life.
"I knew that I couldn't get the big parachute out, and David's wings would be useless with the forty-ton mass of Goliath on its tail. I'd used up two of my seven minutes before I decided what to do.
"It's a good job I made you widen that airlock. Even so, it was a sq,- v space-suit. I tied the end of the safety rope to a locking lever and crawled along the hull until I reached the junction of the two steps.
"The parachute compartment couldn't be opened from the outside, but I'd taken the emergency axe from the pilot's cabin. It didn't take long to get through the magnesium skin: once it had been punctured I could almost tear it apart with my hands. A few seconds later I'd released the 'chute. The silk floated aimlessly around me: I had expected some trace of air-resistance at this speed hut there wasn't a sign of it. The canopy simply stayed where it was put. I could only hope that when we re-entered atmosphere it would spread itself without fouling the rocket.
"I thought I had a fairly good chance of getting away with it. The additional weight of David would increase the loading of the parachute by less than twenty per cent, but there was always the chance that the shrouds would chafe against the broken metal and be worn through before I could reach Earth. In addition the canopy would be distorted when it did open, owing to the unequal lengths of the cords. There was nothing I could do about that.

"When I'd finished, .1 looked about me for the first time. I couldn't see very well, for perspiration bad misted over the glass of my suit. (Someone had better look into that: it can be dangerous.) I was still rising, though very slowly now. To the northeast
I could see the whole of Sicily and some of the Italian mainland: farther south I could follow the Libyan coast as far as Bengasi. Spread out beneath me was all the land over which Alexander and Montgomery and Rommel had fought when I was a boy. It seemed rather surprising that anyone had ever made such a fuss about it.
"I didn't stay long: in three minutes I would be entering the atmosphere. I took a last look at the flaccid parachute, straightened some of the shrouds, and climbed back into the cabin. Then I jettisoned David's fuel-first the oxygen, and then, as soon as it had had time to disperse, the alcohol.
"That three minutes seemed an awfully long time. I was just over twenty-five kilometers high when I heard the first sound. It Was a very high-pitched whistle, so faint that I could scarcely bear it. Glancing through the portholes, I saw that the parachute shrouds Were becoming taut and the canopy was beginning to billow above me. At the same time I felt weight returning and knew that the rocket was beginning to decelerate.

"The calculation wasn't very encouraging. I'd fallen free for over two hundred kilometers and if I was to stop in time I'd need an average deceleration of ten gravities. The peaks might be twice that, but I'd stood fifteen g before now in a lesser cause. So I gave myself a double shot of dynocaine and uncaged the gimbals of my seat. I remember wondering whether I should let out David's little wings, and decided that it wouldn't help. Then I must have blacked out.
,,When I came round again it was very hot, and I had normal weight. I felt very stiff and sore, and to make matters worse the cabin was oscillating violently. I struggled to the port and saw that the desert was uncomfortably close. The big parachute had done its work, but I thought that the impact was going to be rather too violent for comfort. So I jumped.
"From what you tell me I'd have done better to have stayed in the ship. But I don't suppose I can grumble."
We sat in silence for a while. Then Jimmy remarked casually:
"The accelerometer shows that you touched twenty-one gravities on the way down. Only for three seconds, though. Most of the time it was between twelve and fifteen."
David didn't seem to hear and presently I said:
"Well, we can't hold the reporters off much longer. Do you feel like seeing them?"
David hesitated.
"No," he answered. "Not now."
He read our faces and shook his head violently.
"No," he said with emphasis, "it's not that at all. I'd be willing to take off again right now. But I want to sit and think things over for a while."
His voice sank, and when he spoke again it was to show the real David behind the perpetual mask of extraversion.
"You think I haven't any nerves," he said, "and that I take risks without bothering about the consequences. Well, that isn't quite true and I'd like you to know why. I've never told anyone this, not even Mavis.
"You know I'm not superstitious," he began, a little apologetically, "but most materialists have some secret reservations, even if they won't admit them.
"Many years ago I had a peculiarly vivid dream. By itself, it
wouldn't have meant much, but later I discovered that two other men had put almost identical experiences on record. One you've probably read, for the man was J. W. Dunne.
"In his first book, An Experiment with Time, Dunne tells how
once dreamed that he was sitting at the controls of a curious flying machine with swept-back wings, and years later the whole experience came true when he was testing his inherent-stability aeroplane. Remembering my own dream, which I'd had

before reading Dunne's book, this made a considerable impression on me. But the second incident I found even more striking.
"You've heard of Igor Sikorsky: he designed some of the first commercial long-distance flying-boats-'Clippers,' they were called. in his autobiography, The Story of the Winged-S, he tells us how he had a dream very similar to Dunne's.
"He was walking along a corridor with doors opening on either side and electric lights glowing overhead. There was a slight vibration underfoot and somehow he knew that he was in a flying machine. Yet at that time there were no aeroplanes in the world, and few people believed there ever would be.
"Sikorsky's dream, like Dunne's, came true many years later. He was on the maiden flight of his first Clipper when he found himself walking along that familiar corridor."
David laughed, a little self-consciously.
"You've probably guessed what my dream was about," he continued. "Remember, it would have made no permanent impression if I hadn't come across these parallel cases.
"I was in a small, bare room with no windows. There were two other men with me, and we were all wearing what I thought at the time were diving-suits. I had a curious control panel in front of me, with a circular screen built into it. There was a picture on the screen, but it didn't mean anything to me and I can't recall it now, though I've tried many times since. All I remember is turning to the other two men and saying: 'Five minutes to go, boys'-though I'm not sure if those were the exact words. And then, of course, I woke up.
"That dream has haunted me ever since I became a test pilot. No -haunted isn't the right word. It's given me confidence that in the long run everything would be all right-at least until I'm in that cabin with those other two men. What happens after that I don't know. But now you understand why I felt quite safe when I brought

down the A.20, and when I crash-landed the A.15 off Pantelleria. "So now you know. You can laugh if you please: I sometimes do myself. But even if there's nothing in it, that dream's given my subconscious a boost that's been pretty useful."
We didn't laugh, and presently Jimmy said:
"Those other men-did you recognize them?"
David looked doubtful.
"I've never made up my mind," he answered. "Remember, they were wearing space-suits and I didn't see their faces clearly. But one of them looked rather like you, though he seemed a good deal older than you are now. I'm afraid you weren't there, Arthur. Sorry."
"I'm glad to hear it," I said. "As I've told you before, I'll have to stay behind to explain what went wrong. I'm quite content to wait until the passenger service starts."
Jimmy rose to his feet.
"O.K., David," he said, "I'll deal with the gang outside. Get some sleep now-with or without dreams. And by the way, the A.20 will be ready again in a week. I think she'll be the last of the chemical rockets: they say the atomic drive's nearly ready for us."
We never spoke of David's dream again, but I think it was often in our minds. Three months later he took the A.20 up to six hundred and eighty kilometers, a record which will never be broken by a machine of this type, because no one will ever build a chemical rocket again. David's uneventful landing in the Nile Valley marked the end of an epoch.
It was three years before the A.21 was ready. She looked very small compared with her giant predecessors, and it was hard to believe that she was the nearest thing to a spaceship man had yet built. This time the takeoff was from sea level, and the Atlas Mountains which had witnessed the start of our earlier shots were now merely the distant background to the scene.
By now both Jimmy and I had come to share David's belief in his own destiny. I remember Jimmy's parting words as the airlock closed.
"It won't be long now, David, before we build that three-man ship."

And I knew he was only half joking.

We saw the A-21 climb slowly into the sky in great, widening circles, unlike any rocket the world had ever known before. There was no need to worry about gravitational loss now that we had a built-in fuel supply, and David wasn't in a hurry. The machine was still traveling quite slowly when I lost sight of it and went into the plotting room.

When I got there the signal was just fading from the screen, and the detonation reached me a little later. And that was the end of David and his dreams.

The next I recall of that period is flying down the Conway Valley in Jimmy's 'copter, with Snowdon gleaming far away on our right. We had never been to David's home before and were not looking forward to this visit. But it was the least that we could do.

As the mountains drifted beneath us we talked about the suddenly darkened future and wondered what the next step would be. Apart from the shock of personal loss, we were beginning to realize how much of David's confidence we had come to share ourselves. And now that confidence had been shattered.

We wondered what Mavis would do, and discussed the boy's future. He must be fifteen now, though I hadn't seen him for several years and Jimmy had never met him at all. According to his father he was going to be an architect and already showed considerable promise.

Mavis was quite calm and collected, though she seemed much older than when I had last met her. For a while we talked about business matters and the disposal of David's estate. I'd never been an executor before, but tried to pretend that I knew all about it.

We had just started to discuss the boy when we beard the front door open and he came into the house. Mavis called to him and his footsteps came slowly along the passage. We could tell that he didn't want to meet us, and his eyes were still red when he entered the room.

I had forgotten how much like his father he was, and I heard a little gasp from Jimmy.

"Hello, David," I said.

But he didn't look at me. He was staring at Jimmy, with that Puzzled expression of a man who has seen someone before but can't remember where.

And quite suddenly I knew that young David would never be art architect.

The Next Tenants

Arthur C. Clarke

"The number of mad scientists who wish to conquer the world," said Harry Purvis, looking thoughtfully at his beer, "has been grossly exaggerated. In fact, I can remember encountering only a single one."
"Then there couldn't have been many others," commented Bill Temple, a little acidly. "It's not the sort of thing one would be likely to forget."
"I suppose not," replied Harry, with that air of irrefragable innocence which is so disconcerting to his critics. "And, as a matter of fact, this scientist wasn't really mad. There was no doubt, though, that he was out to conquer the world. Or if you want to be really precise-to let the world be conquered."
"And by whom?" asked George Whitley. "The Martians? Or the well-known little green men from Venus?"
"Neither of them. He was collaborating with someone a lot nearer home. You'll realize who I mean when I tell you he was a myrmecologist."
"A which-what?" asked George.
"Let him get on with the story," said Drew, from the other side of the bar. "It's past ten, and if I can't get you all out by closing time this week, I'll lose my license."
"Thank you," said Harry with dignity, handing over his glass for a refill. "This all happened about two years ago, when I was on a mission in the Pacific. It was rather hush-hush, but in view of what's happened since there's no harm in talking about it. Three of us scientists were landed on a certain Pacific atoll not a thousand miles from Bikini, and given a week to set up some detection equipment. it was intended, of course, to keep an eye on our good friends and allies when they started playing with thermo-nuclear reactions -to pick some crumbs from the A.E.C.'s table, as it were. The Russians, naturally, were doing the same thing, and occasionally we ran into each other and then both sides would pretend that there was nobody here but us chickens.
"This atoll was supposed to be uninhabited, but this was a considerable error. It actually had a population of several hundred millions-"
"What!" gasped everybody.
"-several hundred millions," continued Purvis calmly, "of which number, one was human. I came across him when I went inland one day to have a look at the scenery."
"Inland?" asked George Whitley. "I thought you said it was an atoll. How can a ring of coral-"
"It was a very plump atoll," said Harry firmly. "Anyway, who's telling this story?" He waited defiantly for a moment until he had the right of way again.
"Here I was, then, walking up a charming little river-course underneath the coconut palms, when to my great surprise I came across a waterwheel-a very modem-looking one, driving a dynamo. If I'd been sensible, I suppose I'd have gone back and told my companions, but I couldn't resist the challenge and decided to do some reconnoitering on my own.' I remembered that there were still supposed to be Japanese troops around who didn't know that the war was over, but that explanation seemed a bit unlikely.
"I followed the power-line up a hill, and there on the other side was a low, whitewashed building set in a large clearing. All over this clearing were tall, irregular mounds of earth, linked together with a network of wires. It was one of the most baffling sights I have ever seen, and I stood and stared for a good ten minutes, trying to decide what was going on. The longer I looked, the less sense it seemed to make.
141 was debating what to do when a tall, white-haired man came out of the building and walked over to one of the mounds. He was carrying some kind of apparatus and

had a pair of earphones slung around his neck, so I guessed that he was using a Geiger counter. It was just about then that I realized what those tall mounds were. They were termitaries . . . the skyscrapers, in comparison to their

makers, far taller than the Empire State Building, in which the so-called white ants live.

"I watched with great interest, but complete bafflement, while the elderly scientist inserted his apparatus into the base of the termitary, listened intently for a moment, and then walked back towards the building. By this time I was so curious that I decided to make my presence known. Whatever research was going on here obviously had nothing to do with international politics, so I was the only one who'd have anything to hide. You'll appreciate later just what a miscalculation that was.

"I yelled for attention and walked down the hill, waving my arms. The stranger halted and watched me approaching: he didn't look particularly surprised. As I came closer I saw that he had a straggling moustache that gave him a faintly Oriental appearance. He was about sixty years old, and carried himself very erect. Though he was wearing nothing but a pair of shorts, he looked so dignified that I felt rather ashamed of my noisy approach.

"'Good morning, I said apologetically. 'I didn't know that there was anyone else on this island. I'm with an-er-scientific survey party over on the other side.'

"At this, the stranger's eyes lit up. 'Ah,' he said, in almost perfect English, 'a fellow scientist! I'm very pleased to meet you. Come into the house.4

"I followed gladly enough-I was pretty hot after my scramble -and I found that the building was simply one large lab. In a comer was a bed and a couple of chairs, together with a stove and one of those folding wash-basins that campers use. That seemed to sum up the living arrangements. But everything was very neat and tidy: my unknown friend seemed to be a recluse, but he believed in keeping up appearances.

"I introduced myself first, and as I'd hoped he promptly responded. He was one Professor Takato, a biologist from a leading Japanese university. He didn't look particularly Japanese, apart from the moustache I've mentioned. With his erect, dignified bearing he reminded me more of an old Kentucky colonel I once knew.

"After he'd given me some unfamiliar but refreshing Wine, we sat and talked for a couple of hours. Like most scientists he seemed happy to meet someone who would appreciate his work. It was true that my interests lay in physics and chemistry rather than on
the biological side, but I found Professor Takato's research quite fascinating.

"I don't suppose you know much about termites, so IT remind you of the salient facts. They're among the most highly evolved of the social insects, and live in vast colonies throughout the tropics. They can't stand cold weather, nor, oddly enough, can they endure direct sunlight. When they have to get from one place to another, they construct little covered roadways. They seem to have some unknown and almost instantaneous means of communication, and though the individual termites are pretty helpless and dumb, a whole colony behaves like an intelligent animal. Some writers have drawn comparisons between a termitary and a human body, which is also composed of individual living cells making up an entity much higher than the basic units. The termites are often called 'white ants', but that's a completely incorrect name as they aren't ants at all but quite a different species of insect. Or should I say 'genus'? I'm pretty vague about this sort of thing . . . .

"Excuse this little lecture, but after I'd listened to Takato for a while I began to get quite enthusiastic about termites myself. Did you know, for example, that they not only cultivate gardens but also keep cows-insect cows, of course-and milk them? Yes, they're sophisticated little devils, even though they do it all by instinct.

"But I'd better tell you something about the Professor. Although he was alone at the moment, and had lived on the island for several years, he had a number of assistants who brought equipment from Japan and helped him in his work. His first great achievement was to do for the termites what von Frische had done with bees-he'd learned their language. It was much more complex than the system of

communication that bees use, which as you probably know, is based on dancing. I understood that the network of wires linking the termitaries to the lab not only enabled Professor Takato to listen to the termites talking among each other, but also permitted him to speak to them. That's not really as fantastic as it sounds, if you use the word "speak" in its widest sense, We speak to a good many animals-not always with our voices, by any means. When you throw a stick for your dog and expect him to run and fetch it, that's a form of speech-sign language. The Professor, I gathered, had worked out some kind of code which the termites

understood, though how efficient it was at communicating ideas I didn't know.
"I came back each day, when I could spare the time, and by the end of the week we were firm friends. It may surprise you that I was able to conceal these visits from my colleagues, but the island was quite large and we each did a lot of exploring. I felt somehow that Professor Takato was my private property, and did not wish to expose him to the curiosity of my companions. They were rather uncouth characters-graduates of some provincial university like Oxford or Cambridge.
"I'm glad to say that I was able to give the Professor a certain amount of assistance, fixing his radio and lining up some of his electronic gear. He used radioactive tracers a good deal, to follow individual termites around. He'd been tracking one with a Geiger counter when I first met him, in fact.
"Four or five days after we'd met, his counters started to go haywire, and the equipment we'd set up began to reel in its recordings. Takato guessed what had happened: he'd never asked me exactly what I was doing on the islands, but I think he knew. When I greeted him he switched on his counters and let me listen to the roar of radiation. There had been some radioactive fall-out-not enough to be dangerous, but sufficient to bring the background way up.
"'I think,' he said softly, 'that you physicists are playing with your toys again. And very big ones, this time.'
"'I'm afraid you're right,' I answered. We wouldn't be sure until the readings had been analyzed, but it looked as if Teller and his team had started the hydrogen reaction. 'Before long, we'll. be able to make the first A-bombs look like damp squibs.'
"'My family,' said Professor Takato, without any emotion, 'was at Nagasaki.'
"There wasn't a great deal I could say to that, and I was glad when he went on to add: 'Have you ever wondered who will take over when we are finished?'
"'Your termites? I said, half facetiously. He seemed to hesitate for a moment. Then he said quietly, 'Come with me; I have not shown you everything.'
"We walked over to a comer of the lab where some equipment lay concealed beneath dust-sheets, and the Professor uncovered a
rather curious piece of apparatus. At first sight it looked like one of the manipulators used for the remote handling of dangerously radioactive materials. There were handgrips that conveyed movements through rods and levers, but everything seemed to focus on a small box a few inches on a side. 'What is it? I asked.
"'It's a micromanipulator. The French developed them for biological work. There aren't many around yet.'
"Then I remembered. These were devices with which, by the use of suitable reduction gearing, one could carry out the most incredibly delicate operations. You moved your finger an inch-and the tool you were controlling moved a thousandth of an inch. The French scientists who had developed this technique had built tiny forges on which they could construct minute scalpels and tweezers from fused glass. Working entirely through microscopes, they had been able to dissect individual cells. Removing an appendix from a termite (in the highly doubtful event of the insect possessing one) would be child's play with such an instrument.
"'I am not very skilled at using the manipulator,' confessed Takato. 'One of my assistants does all the work with it. I have shown no one else this, but you have been very helpful Come with me, please.'
"We went out into the open, and walked past the avenues of tall, cement-hard mounds. They were not all of the same architectural design, for there are many

different kinds of termites-some, indeed, don't build mounds at all. I felt rather like a giant walking through Manhattan, for these were skyscrapers, each with its own teeming population.
"There was a small metal (not wooden-the termites would soon have fixed that!) hut beside one of the mounds, and as we entered it the glare of sunlight was banished. The Professor threw a switch, and a faint red glow enabled me to see various types of optical equipment.
"'They hate light,' he said, 'so it's a great problem observing them. We solved it by using infra-red. This is an image-converter of the type that was used in the war for operations at night. You know about them?
"'Of course,' I said. 'Snipers had them fixed on their rifles so that they could go sharp-shooting in the dark. Very ingenious things -I'm glad you've found a civilized use for them.'

"It was a long time before Professor Takato found what he wanted. He seemed to be steering some kind of periscope arrangement, probing through the corridors of the termite city. Then he said: 'Quick-before they've gone!'
"I moved over and took his position. It was a second or so before my eye focused properly, and longer still before I understood the scale of the picture I was seeing. Then I saw six termites, greatly enlarged, moving rather rapidly across the field of vision. They were traveling in a group, like the huskies forming a dog-team. And that was a very good analogy, because they were towing a sledge . . . .
"I was so astonished that I never even noticed what kind of load they were moving. When they had vanished from sight, I turned to Professor Takato. My eyes had now grown accustomed to the faint red glow, and I could see him quite well.
"'So that's the sort of tool you've been building with your micromanipulator!' I said. 'It's amazing-I'd never have believed it.'
"'But that is nothing,' replied the Professor. 'Performing fleas will pull a cart around. I haven't told you what is so important. We only made a few of those sledges. The one you saw they constructed themselves.'
"He let that sink in: it took some time. Then he continued quietly, but with a kind of controlled enthusiasm in his voice: Remember that the termites, as individuals, have virtually no intelligence. But the colony as a whole is a very high type of organism -and an immortal one, barring accidents. It froze in its present instinctive pattern millions of years before Man was born, and by itself it can never escape from its present sterile perfection. It has reached a dead-end-because it has no tools, no effective way of controlling nature. I have given it the lever, to increase its power, and now the sledge, to improve its efficiency. I have thought of the wheel, but it is best to let that wait for a later stage-it would not be very useful now. The results have exceeded my expectations. I started with this termitary alone-but now they all have the same tools. They have taught each other, and that proves they can cooperate. True, they have wars-but not when there is enough food for all, as there is here.
"'But you cannot judge the termitary by human standards. What I hope to do is to jolt its rigid, frozen culture-to knock it out
of the groove in which it has stuck for so many millions of years. I will give it more tools, more new techniques-and before I die, I hope to see it beginning to invent things for itself.'
"'Why are you doing this? I asked, for I knew there was more than mere scientific curiosity here.
"'Because I do not believe that Man will survive, yet I hope to preserve some of the things he has discovered. If he is to be a dead-end, I think that another race should be given a helping hand. Do you know why I chose this island? It was so that my experiment should remain isolated. My super termite, if it ever evolves, will have to remain here until it has reached a very high level of attainment. Until it can cross the Pacific, in fact . . . .
"'There is another possibility. Man has no rival on this planet. I think it may do him good to have one. It may be his salvation.'

"I could think of nothing to say: this glimpse of the Professor's dreams was so overwhelming-and yet, in view of what I had just seen, so convincing. For I knew that Professor Takato was not mad. He was a visionary, and there was a sublime detachment about his outlook, but it was based on a secure foundation of scientific achievement.
"And it was not that he was hostile to mankind: he was sorry for it. He simply believed that humanity had shot its bolt, and wished to save something from the wreckage. I could not feel it in my heart to blame him.
"We must have been in that little hut for a long time, exploring possible futures. I remember suggesting that perhaps there might be some kind of mutual understanding, since two cultures so utterly dissimilar as Man and Termite need have no cause for conflict. But I couldn't really believe this, and if a contest comes, I'm not certain who will win. For what use would man's weapons be against an intelligent enemy who could lay waste all the wheat fields and all the rice crops in the world?
"When we came out into the open once more, it was almost dusk. It was then that the Professor made his final revelation.
"'In a few weeks,' he said, 'I am going to take the biggest step of all.'
"'And what is that? I asked.
"'Cannot you guess? I am going to give them fire.'
"Those words did something to my spine. I felt a chill that had

nothing to do with the oncoming night. The glorious sunset that was taking place beyond the palms seemed symbolic-and suddenly I realized that the symbolism was even deeper than I had thought.
"That sunset was one of the most beautiful I had ever seen, and it was partly of man's making. Up there in the stratosphere, the dust of an island that had died this day was encircling the earth. My race had taken a great step forward; but did it matter now?
"'I am going to give them fire.' Somehow, I never doubted that the Professor would succeed. And when he had done so, the forces that my own race had just unleashed would not save it . . . .
"The flying boat came to collect us the next day, and I did not see Takato again. He is still there, and I think he is the most important man in the world. While our politicians wrangle, he is making us obsolete.
"Do you think that someone ought to stop him? There may still be time. I've often thought about it, but I've never been able to think of a really convincing reason why I should interfere. Once or twice I nearly made up my mind, but then I'd pick up the newspaper and see the headlines.
"I think we should let them have the chance. I don't see how they could make a worse job of it than we've done."

Patent Pending

The author of Childhood's End, Rendezvous with Rama, and Imperial Earth certainly needs no introduction. However, Clarke's excellence as a novelist has tended to obscure his skill as a master of the short story. Future critics and historians of science fiction may indeed discuss Clarke for his contributions to the short story rather than the quality of his longer work. In "Patent Pending" he addresses himself to one of the truisms of economic life-if you outlaw the product, you increase the demand (or certainly the price). In the United States, the experience of Prohibition and, more recently, legalities over marijuana have supplied us with considerable evidence in this regard, as have the books banned in Boston or any other number of examples. In the film 2001: A Space Odyssey, Clarke projected a future that included Pan American and Howard Johnsons. Here Clarke portrays a business opportunity of the future that promises great rewards, but which carries with it certain risks.

There are no subjects that have not been discussed, at some time or other, in the saloon bar of the White Hart-and whether or not there are ladies present makes no difference whatsoever. After all, they came in at their own risk. Three of them, now I come to think of it, have eventually gone out again with husbands. So perhaps the risk isn't on their side at all . . . .

I mention this because I would not like you to think that all our conversations are highly erudite and scientific, and our activities purely cerebral. Though chess is rampant, darts and shove-ha'penny also flourish. The Times Literary Supplement, the Saturday Review, the New Statesman and the Atlantic Monthly may be brought in by some of the customers, but the same people are quite likely to leave with the latest issue of Staggering Stories of Pseudoscience.

A great deal of business also goes on in the obscurer comers of the pub. Copies of antique books and magazines frequently change hands

at astronomical prices, and on almost any Wednesday at least three well-known dealers may be seen smoking large cigars as they lean over the bar, swapping stories with Drew. From time to time a vast guffaw announces the denouement of some anecdote and provokes a flood of anxious inquiries from patrons who are afraid they may have missed something. But, alas, delicacy forbids that I should repeat any of these interesting tales here. Unlike most things in this island, they are not for export . . . .

Luckily, no such restrictions apply to the tales of Mr. Harry Purvis, B.Sc. (at least), Ph.D. (probably), F.R.S. (personally I don't think so, though it has been rumored). None of them would bring a blush to the cheeks of the most delicately nurtured maiden aunts, should any still survive in these days.

I must apologize. This is too sweeping a statement. There was one story which might, in some circles, be regarded as a little daring. Yet I do not hesitate to repeat it, for I know that you, dear reader, will be sufficiently broad-minded to take no offense.

It started in this fashion. A celebrated Fleet Street reviewer had been pinned into a corner by a persuasive publisher, who was about to bring out a book of which he had high hopes. It was one of the riper productions the "and-then-the-house-gave-another-lurch-as-the-termites-finished-the-east-wing" school of fiction. Eire had already banned it, but that is an honor which few books escape nowadays, and certainly could not be considered a distinction. However, if a leading British newspaper could be induced to make a stem call for its suppression, it would become a best-seller overnight . . . .

Such was the logic of its publisher, and he was using all his wiles to induce cooperation. I heard him remark, apparently total any scruples his reviewer friend might have, "Of course not if they can understand it, they can't be corrupted any further!" And then Harry Purvis, who has an uncanny knack of following half a dozen conversations simultaneously, so that he can insert himself in the right one at the right time, said in his peculiarly penetrating and noninterruptable voice:

"Censorship does raise some very difficult problems, doesn't it? I've always argued that there's an inverse correlation between a country's degree of civilization and the restraints it puts on its press.
A New England voice from the back of the room cut in: "On that argument, Paris is a more civilized place than Boston." .

"Precisely," answered Purvis. For once, he waited for a reply.
"O.K." said the New England voice mildly. "I'm not arguing. I just wanted to check."
"To continue," said Purvis, wasting no more time in doing so, "I'm reminded of a matter which has not yet concerned the censor, but which will certainly do so before long. It began in France, and so far has remained there. When it does come out into the open, it may have a greater impact on our civilization than the atom bomb.
"Like the atom bomb, it arose out of equally academic research. Never, gentlemen, underestimate science. I doubt if there is a single field of study so theoretical, so remote from what is laughingly called everyday life, that it may not one day produce something that will shake the world.
"You will appreciate that the story I am telling you is, for once in a while, secondhand. I got it from a colleague at the Sorbonne last year while I was over there at a scientific conference. So the names are all fictitious: I was told them at the time, but I can't remember them now.
"Professor-ah-Julian was an experimental physiologist at one of the smaller, but less impecunious, French universities. Some of you may remember that rather unlikely tale we heard here the other week from that fellow Hinckelberg, about his colleague who'd learned how to control the behavior of animals through feeding the correct currents into their nervous systems. Well, if there was any truth in that story and frankly I doubt it-the whole project was probably inspired by Julian's papers in Comptes Rendus.
"Professor Julian, however, never published his most remarkable results. When you stumble on something which is really terrific, you don't rush into print. You wait until you have overwhelming evidence-unless you're afraid that someone else is hot on the track. Then you may issue an ambiguous report that will establish your priority at a later date, without giving too much away at the moment-like the famous cryptogram that Huygens put out when he detected the rings of Saturn.
"You may well wonder what Julian's discovery was, so I won't keep you in suspense. It was simply the natural extension of what man has been doing for the last hundred years. First the camera gave us the power to capture scenes. Then Edison invented the phonograph, and sound was mastered. Today, in the talking film, we have a kind of mechanical memory which would be inconceivable to our forefathers.

But surely the matter cannot rest there. Eventually science must be able to catch and store thoughts and sensations themselves, and feed them back into the mind so that, whenever it wishes, it can repeat any experience in life, down to its minutest detail."
" That's an old idea!" snorted someone. "See the 'feelies' in Brave New World."
"All good ideas have been thought of by somebody before they are realized," said Purvis severely. "The point is that what Huxley and others had talked about, Julian actually did. My goodness, there's a pun there! Aldous-Julian-oh, let it pass!
"It was done electronically, of course. You all know how the encephalograph can record the minute electrical impulses in the living brain-the so-called 'brain waves,' as the popular press calls them. Julian's device was a much subtler elaboration of this well-known instrument. And, having recorded cerebral impulses, he could play them back again. It sounds simple, doesn't it? So. was the phonograph, but it took the genius of Edison to think of it.
"And now, enter the villain. Well, perhaps that's too strong a word, for Professor Julian's assistant Georges-Georges Dupin is really quite a sympathetic character. It was just that, being a Frenchman of a more practical turn of mind than the

Professor, he saw at once that there were some milliards of francs involved in this laboratory toy.
"The first thing was to get it out of the laboratory. The French have an undoubted flair for elegant engineering, and after some weeks of work-with the full cooperation of the Professor-Georges had managed to pack the 'playback' side of the apparatus into a cabinet no larger than a television set, and containing not very many more parts.
"Then Georges was ready to make his first experiment. It would involve considerable expense, but as someone so rightly remarked you cannot make omelets-, without breaking eggs. And the analogy is, if I may say so, an exceedingly apt one.
"For Georges went to see the most famous gourmet in France, and made an interesting proposition. It was one that the great man could not refuse, because it was so unique a tribute to his eminence. Georges explained patiently that he had invented a device for registering (he said nothing about storing) sensations. In the cause of science, and for the honor of the French cuisine, could he be privileged to analyze the emotions, the subtle nuances of gustatory discrimination, that took place in Monsieur le Baron's mind when he employed his unsurpassed

talents? Monsieur could name the restaurant, the chef and the menueverything would be arranged for his convenience. Of course, if he was too busy, no doubt that well-known epicure, Le Compte de-
"The Baron, who was in some respects a surprisingly coarse man, uttered a word not to be found in most French dictionaries. 'That cretin!' he exploded. 'He would be happy on English cooking! No, I shall do it.' And forthwith he sat down to compose the menu, while Georges anxiously estimated the cost of the items and wondered if his bank balance would stand the strain . . . .
"It would be interesting to know what the chef and the waiters thought about the whole business. There was the Baron, seated at his favorite table and doing full justice to his favorite dishes, not in the least inconvenienced by the tangle of wires that trailed from his head to that diabolical-looking machine in the comer. The restaurant was empty of all other occupants, for the last thing Georges wanted was premature publicity. This had added very considerably to the already distressing cost of the experiment. He could only hope that the results would be worth it.
"They were. The only way of proving that, of course, would be to play back Georges's recording. We have to take his word for it, since the utter inadequacy of words in such matters is all too well known. The Baron was a genuine connoisseur, not one of those who merely pretend to powers of discrimination they do not possess. You know Thurber's Only a naive domestic Burgundy, -but I think you'll admire its presumption.' The Baron would have known at the first sniff whether it was domestic or not-and if it had been presumptuous he'd have smacked it down.
"I gather that Georges had his money's worth out of that recording, even though he had not intended it merely for personal use. It opened up new worlds to him, and clarified the ideas that had been forming in his ingenious brain. There was no doubt about it: all the exquisite sensations that had passed through the Baron's mind during the consumption of that Lucullan repast had been captured, so that anyone else, however untrained he might be in such matters, could savor them to the full. For, you see, the recording dealt purely with emotions: intelligence did not come into the picture at all. The Baron needed a lifetime of knowledge and training before he could experience these sensations. But once they were down on tape, anyone, even if in real life he had no sense of taste at all, could take over from there.

"Think of the glowing vistas that opened up before Georges's eyes! There were other meals, other gourmets. There were the collected impressions of all the vintages of Europe-what would connoisseurs not pay for them? When the last bottle of a rare wine had been broached, its incorporeal essence could be preserved, as the voice of Melba can travel down the centuries. For, after all, it was not the wine itself that mattered, but the sensations it evoked . . .

"So mused Georges. But this, he knew, was only a beginning. The French claim to logic I have often disputed, but in Georges's case it cannot be denied. He thought the matter over for a few days: then he went to see his petite dame.
" 'Yvonne, ma cheri, he said, 'I have a somewhat unusual request to make of you . . . ' "
Harry Purvis knew when to break off in a story. He turned to the bar and called, "Another Scotch, Drew." No one said a word while it was provided.
"To continue," said Purvis at length, "the experiment, unusual though it was, even in France, was successfully carried out. As both discretion and custom demanded, all was arranged in the lonely hours of the night. You will have gathered already that Georges was a persuasive person, though I doubt if Mam'selle needed much persuading.
"Stifling her curiosity with a sincere but hasty kiss, Georges saw Yvonne out of the lab and rushed back to his apparatus. Breathlessly, he ran through the playback. It worked-not that he had ever had any real doubts. Moreover-do please remember I have only my informant's word for this-it was indistinguishable from the real thing. At that moment something approaching religious awe overcame Georges. This was, without a doubt, the greatest invention in history. He would be immortal as well as wealthy, for he had achieved something of which all men had dreamed, and had robbed old age of one of its terrors . . . .
"He also realized that he could now dispense with Yvonne, if he so wished. This raised implications that would require further thought. Much further thought.
"You will, of course, appreciate that I am giving you a highly condensed account of events. While all this was going on, Georges was still working as a loyal employee of the Professor, who suspected nothing. As yet, indeed, Georges had done little more than any research worker might have in similar circumstances. His performances

had been somewhat beyond the call of duty, but could all be explained away if need be.
"The next step would involve some very delicate negotiations and the expenditure of further hard-won francs. Georges now had all the material he needed to prove, beyond a shadow of doubt, that he was handling a very valuable commerical property. There were shrewd businessmen in Paris who would jump at the opportunity. Yet a certain delicacy, for which we must give him full credit, restrained Georges from using his second-er-recording as a sample of the wares his machine could purvey. There was no way of disguising the personalities involved, and Georges was a modest man. 'Besides,' he argued, again with great good sense, 'when the gramophone company wishes to make a disque, it does not enregister the performance of some amateur musician. That is a matter for professionals. And so, ma foi, is this.' Whereupon, after a further call at his bank, he set forth again for Paris.
"He did not go anywhere near the Place Pigalle, because that was full of Americans and prices were accordingly exorbitant. Instead, a few discreet inquiries and some understanding cabdrivers took him to an almost oppressively respectable suburb, where he presently found himself in a pleasant waiting room, by no means as exotic as might have been supposed.
"And there, somewhat embarrassed, Georges explained his mission to a formidable lady whose age one could have no more guessed than her profession. Used though she was to unorthodox requests, this was something she had never encountered in all her considerable experience. But the customer was always right, as long as he had the cash, and so in due course everything was arranged. One of the young ladies and her boy friend, an apache of somewhat overwhelming masculinity, traveled back with Georges to the provinces. At first they were, naturally, somewhat suspicious, but as Georges had already found, no expert can ever resist flattery. Soon they were all on excellent terms. Hercule and Susette promised Georges that they would give him every cause for satisfaction.
"No doubt some of you would be glad to have further details, but you can scarcely expect me to supply them. All I can say is that Georges-or rather his instrument-was kept very busy, and that by the morning little of the recording material was left unused. For it seems that Hercule was indeed appropriately named . . . . "When

this piquant episode was finished, Georges had very little money left, but he did possess two recordings that were quite beyond price. Once more he set off to Paris, where, with practically no trouble, he came to terms with some businessmen who were so astonished that they gave him a very generous contract before coming to their senses. I am pleased to report this, because so often the scientist emerges second best in his dealings with the world of finance. I'm equally pleased to record that Georges had made provision for Professor Julian in the contract. You may say cynically that it was, after all, the Professor's invention, and that sooner or later Georges would have had to square him. But I like to think there was more to it than that.

"The full details of the scheme for exploiting the device are, of course, unknown to me. I gather that Georges had been expansively eloquent-not that much eloqence was needed to convince anyone who had once experienced one or both of his playbacks. The market would be enormous, unlimited. The export trade alone could put France on her feet again and would wipe out her dollar deficit overnight-once certain snags had been overcome. Everything would have to be managed through somewhat clandestine channels, for think of the hubbub from the hypocritical Anglo-Saxons when they discovered just what was being imported into their countries. The Mother's Union, The Daughters of the American Revolution, The Housewives League, and all the religious organizations would rise as one. The lawyers were looking into the matter very carefully, and as far as could be seen the regulations that still excluded Tropic of Capricorn from the mails of the English-speaking countries could not be applied to this case-for the simple reason that no one had thought of it. But there would be such a shout for new laws that Parliament and Congress would have to do something, so it was best to keep under cover as long as possible.

"In fact, as one of the directors pointed out, if the recordings were banned, so much the better. They could make more money on a smaller output, because the price would promptly soar and all the vigilance of the Customs Officials couldn't block every leak. It would be Prohibition all over again.

"You will scarcely be surprised to hear that by this time Georges had somewhat lost interest in the gastronomical angle. It was an interesting but definitely minor possibility of the invention. Indeed, this had been tacitly admitted by the directors as they drew up the articles

of association, for they had included the pleasures of the cuisine among 'subsidiary rights.'

"Georges returned home with his head in the clouds, and a substantial check in his pocket. A charming fancy had struck his imagination. He thought of all the trouble to which the gramophone companies had gone so that the world might have the complete recordings of the Forty-eight Preludes and Fugues or the Nine Symphonies. Well, his new company would put out a complete and definite set of recordings, performed by experts versed in the most esoteric knowledge of East and West. How many opus numbers would be required? That, of course, had been a subject of profound debate for some thousands of years. The Hindu textbooks, Georges had heard, got well into three figures. It would be a most interesting research, combining profit with pleasure in an unexampled manner . . . . He had already begun some preliminary studies, using treatises which even in Paris were none too easy to obtain.

"if you think that while all this was going on, Georges had neglected his usual interests, you are all too right. He was working literally night and day, for he had not yet revealed his plans to the Professor and almost everything had to be done when the lab was closed. And one of the interests he had had to neglect was Yvonne.

" Her curiosity had already been aroused, as any girl's would have been. But now she was more than intrigued-she was distracted. For Georges had become so remote and cold. He was no longer in love with her.

"It was a result that might have been anticipated. Publicans have to guard against the danger of sampling their own wares too often-I'm sure you don't, Drew-and Georges had fallen into this seductive trap. He had been through that recording too

many times, with somewhat debilitating results. Moreover, poor Yvonne was not to be compared with the experienced and talented Susette. It was the old story of the professional versus the amateur.
"All that Yvonne knew was that Georges was in love with someone else. That was true enough. She suspected that he had been unfaithful to her. And that raises profound philosophical questions we can hardly go into here.
"This being France, in case you had forgotten, the outcome was inevitable. Poor Georges! He was working late one night at the lab, as usual, when Yvonne finished him off with one of those ridiculous

ornamental pistols which are de rigueur for such occasions. Let us drink to his memory."
"That's the trouble with all your stories," said John Beynon. "You tell us about wonderful inventions, and then at the end it turns out that the discoverer was killed, so no one can do anything about it. For I suppose, as usual, the apparatus was destroyed?"
"But no," replied Purvis. "Apart from Georges, this is one of the stories that has a happy ending. There was no trouble at all about Yvonne, of course. Georges' grieving sponsors arrived on the scene with great speed and prevented any adverse publicity. Being men of sentiment as well as men of business, they realized that they would have to secure Yvonne's freedom. They promptly did this by playing the recording to le Maire and le Pre fet, thus convincing them that the poor girl had experienced irresistible provocation. A few shares in the new company clinched the deal, with expressions of the utmost cordiality on both sides. Yvonne even got her gun back."
"Then when-" began someone else.
"Ah, these things take time. There's the question of mass production, you know. It's quite possible that distribution has already commenced through private-very private-channels. Some of those dubious little shops and notice boards around Leicester Square may soon start giving hints."
"Of course," said the New England voice disrespectfully, "you wouldn't know the name of the company."
You can't help admiring Purvis at times like this. He scarcely hesitated.
"Le Societe Anonyme d'Aphrodite," he replied. "And I've just remembered something that will cheer you up. They hope to get round your sticky mails regulations and establish themselves before the inevitable congressional inquiry starts. They're opening up a branch in Nevada: apparently you can still get away with anything there." He raised his glass.
"To Georges Dupin," he said solemnly. "Martyr to science. Remember him when the fireworks start. And one other thing-"
"Yes?" we all asked.
"Better start saving now. And sell your TV sets before the bottom drops out of the market."

The Reluctant Orchid
Arthur C. Clarke
1956 Renown Publishing Co. Inc.

Though few people in the "White Hart" will concede that any of Harry Purvis' stories are actually true, everyone agrees that some are much more probable than others. And on any scale of probability, the affair of the Reluctant Orchid must rate very low indeed.

I don't remember what ingenious gambit Harry used to launch this narrative: maybe some orchid fancier brought his latest monstrosity into the bar, and that set him off. No matter. I do remember the story, and after all that's what counts.

The adventure did not, this time, concern any of Harry's numerous relatives, and he avoided explaining just how he managed to know so many of the sordid details. The hero-if you can call him that-of this hothouse epic was an inoffensive little clerk named Hercules Keating. And if you think that is the most unlikely part of the story, just stick round a while.

Hercules is not the sort of name you can carry off lightly at the best of times, and when you are four foot nine and look as if you'd have to take a physical culture course before you can even become a 97-pound weakling, it is a positive embarrassment. Perhaps it helped to explain why Hercules had very little social life, and all his real friends grew in pots in a humid conservatory at the bottom of his garden. His needs were simple and he spent very little money on himself; consequently his collection of orchids and cacti was really rather remarkable. Indeed, he had a wide reputation among the fraternity of cactophiles, and often received from remote comers of the globe, parcels smelling of mould and tropical jungles.

Hercules had only one living relative, and it would have been

hard to find a greater contrast than Aunt Henrietta. She was a massive six footer, usually wore a rather loud line in Harris tweeds, drove a Jaguar with reckless skill, and chain-smoked cigars. Her parents had set their hearts on a boy, and had never been able to decide whether or not their wish had been granted. Henrietta earned a living, and quite a good one, breeding dogs of various shapes and sizes. She was seldom without a couple of her latest models, and they were not the type of portable canine which ladies like to carry in their handbags. The Keating Kennels specialized in Great Danes, Alsatians, and Saint Bernards . . . .

Henrietta, rightly despising men as the weaker sex, had never married. However, for some reason she took an avuncular (yes, that is definitely the right word) interest in Hercules, and called to see him almost every weekend. It was a curious kind of relationship: probably Henrietta found that Hercules bolstered up her feelings of superiority. If he was a good example of the male sex, then they were certainly a pretty sorry lot. Yet, if this was Henrietta's motivation, she was unconscious of it and seemed genuinely fond of her nephew. She was patronizing, but never unkind.

As might be expected, her attentions did not exactly help Hercules' own well-developed inferiority complex. At first he had tolerated his aunt; then he came to dread her regular visits, her booming voice and her bone-crushing handshake; and at last he grew to hate her. Eventually, indeed, his hate was the dominant emotion in his life, exceeding even his love for his orchids. But he was careful not to show it, realizing that if Aunt Henrietta discovered how he felt about her, she would probably break him in two and throw the pieces to her wolf pack.

There was no way, then, in which Hercules could express his pent-up feelings. He had to be polite to Aunt Henrietta even when he felt like murder. And he often did feel like murder, though he knew that there was nothing he would ever do about it. Until one day . . .

According to the dealer, the orchid came from "somewhere in the Amazon region"-a rather vague postal address. When Hercules first saw it, it was not a very

prepossessing sight, even to anyone who loved orchids as much as he did. A shapeless root, about the size of a man's fist-that was all. It was redolent of decay, and there was the faintest hint of a rank, carrion smell. Hercules was not even sure that it was viable, and told the dealer as much. Perhaps that enabled him to purchase it for a trifling sum, and he carried it home without much enthusiasm.
It showed no signs of life for the first month, but that did not worry Hercules. Then, one day, a tiny green shoot appeared and started to creep up to the light. After that, progress was rapid. Soon there was a thick, fleshy stem as big as a man's forearm, and colored a positively virulent green. Near the top of the stem a series of curious bulges circled the plant: otherwise it was completely featureless. Hercules was now quite excited: he was sure that some entirely new species had swum into his ken.
The rate of growth was now really fantastic: soon the plant was taller than Hercules, not that that was saying a great deal. Moreover, the bulges seemed to be developing, and it looked as if at any moment the orchid would burst into bloom. Hercules waited anxiously, knowing how short-lived some flowers can be, and spent as much time as he possibly could in the hothouse. Despite all his watchfulness, the transformation occurred one night while he was asleep.
In the morning, the orchid was fringed by a series of eight dangling tendrils, almost reaching to the ground. They must have developed inside the plant and emerged with-for the vegetable world-explosive speed. Hercules stared at the phenomenon in amazement, and went very thoughtfully to work.
That evening, as he watered the plant and checked its soil, he noticed a still more peculiar fact. The tendrils were thickening, and they were not completely motionless. They had a slight but unmistakable tendency to vibrate, as if possessing a life of their own. Even Hercules, for all his interest and enthusiasm, found this more than a little disturbing.
A few days later, there was no doubt about it at all. When he approached the orchid, the tendrils swayed toward him in an unpleasantly suggestive fashion. The impression of hunger was so strong that Hercules began to feel very uncomfortable indeed, and something started to nag at the back of his mind. It was quite a while before he could recall what it was: then he said to himself, "Of course! How stupid of me!" and went along to the local library. Here he spent a most interesting half-hour rereading a little piece by one H. G. Wells entitled, "The Flowering of the Strange Orchid."

"My goodness!" thought Hercules, when he had finished the tale. As yet there had been no stupefying odor which might overpower the plant's intended victim, but otherwise the characteristics were all too similar. Hercules went home in a very unsettled mood indeed.
He opened the conservatory door and stood looking along the avenue of greenery towards his prize specimen. He judged the length of the tendrils-already he found himself calling them tentacles with great care and walked to within what appeared a safe distance. The plant certainly had an impression of alertness and menace far more appropriate to the animal than the vegetable kingdom. Hercules remembered the unfortunate history of Doctor Frankenstein, and was not amused.
But, really, this was ridiculous! Such things didn't happen in real life. Well, there was one way to put matters to the test . . .
Hercules went into the house and came back a few minutes later with a broomstick, to the end of which he had attached a piece of raw meat. Feeling a considerable fool, he advanced towards the orchid as a lion-tamer might approach one of his charges at meal-time.
For a moment, nothing happened. Then two of the tendrils developed an agitated twitch. They began to sway back and forth, as if the plant was making up its mind. Abruptly, they whipped out with such speed that they practically vanished from view. They wrapped themselves round the meat, and Hercules felt a powerful tug at the end of his broomstick. Then the meat was gone: the orchid was clutching it, if one may mix metaphors slightly, to its bosom.

"Jumping Jehosophat!" yelled Hercules. It was very seldom indeed that he used such strong language.

The orchid showed no further signs of life for twenty-four hours. It was waiting for the meat to become high, and it was also developing its digestive system. By the next day, a network of what looked like short roots had covered the still visible chunk of meat. By nightfall, the meat was gone.

The plant had tasted blood.

Hercules' emotions as he watched over his prize were curiously mixed. There were times when it almost gave him nightmares, and

he foresaw a whole range of horrid possibilities. The orchid was now extremely strong, and if he got within its clutches he would be done for. But, of course, there was not the slightest danger of that. He had arranged a system of pipes so that it could be watered from a safe distance, and its less orthodox food he simply tossed within range of its tentacles. It was now eating a pound of raw meat a day, and he had an uncomfortable feeling that it could cope with much larger quantities if given the opportunity.

Hercules' natural qualms were, on the whole, outweighed by his feeling of triumph that such a botanical marvel had fallen into his hands. Whenever he chose, he could become the most famous orchid-grower in the world. It was typical of his somewhat restricted view-point that it never occurred to him that other people besides orchid-fanciers might be interested in his pet.

The creature was now about six feet tall, and apparently still growing-though much more slowly than it had been. All the other plants had been moved from its end of the conservatory, not so much because Hercules feared that it might be cannibalistic as to enable him to tend them without danger. He had stretched a rope across the central aisle so that there was no risk of his accidentally walking within range of those eight dangling arms.

It was obvious that the orchid had a highly developed nervous system, and something very nearly approaching intelligence. It knew when it was going to be fed, and exhibited unmistakable signs of pleasure. Most fantastic of all-though Hercules was still not sure about this-it seemed capable of producing sounds. There were times, just before a meal, when he fancied he could hear an incredibly high-pitched whistle, skirting the edge of audibility. A new-born bat might have had such a voice: he wondered what purpose it served. Did the orchid somehow lure its prey into its clutches by sound? If so, he did not think the technique would work on him.

While Hercules was making these interesting discoveries, he continued to be fussed over by Aunt Henrietta and assaulted by her hounds, which were never as house-trained as she claimed them to be. She would usually roar up the street on a Sunday afternoon with one dog in the seat beside her and another occupying most of the baggage compartment. Then she would bound up the steps two at a time, nearly deafen Hercules with her greeting, half paralyze him with her handshake, and blow cigar smoke in his face. There

had been a time when he was terrified that she would kiss him, but he had long since realized that such effeminate behavior was foreign to her nature.

Aunt Henrietta looked upon Hercules' orchids with some scorn. Spending one's spare time in a hothouse was, she considered, a very effete recreation. When she wanted to let off steam, she went big-game hunting in Kenya. This did nothing to endear her to Hercules, who hated blood sports. But despite his mounting dislike for his overpowering aunt, every Sunday afternoon he dutifully prepared tea for her and they had a t8te-A-t6te together which, on the surface at least, seemed perfectly friendly. Henrietta never guessed that as he poured the tea Hercules often wished it was poisoned: she was, far down beneath her extensive fortifications, a fundamentally good-hearted person and the knowledge would have upset her deeply.

Hercules did not mention his vegetable octopus to Aunt Henrietta. He had occasionally shown her his most interesting specimens, but this was something he was keeping to himself. Perhaps, even before he had fully formulated his diabolical plan, his subconscious was already preparing the ground . . .

It was late one Sunday evening, when the roar of the Jaguar had died away into the night and Hercules was restoring his shattered nerves in the conservatory, that the idea first came fully fledged into his mind. He was staring at the orchid, noting how the tendrils were now as thick around as a man's thumb, when a most pleasing fantasy suddenly flashed before his eyes. He pictured Aunt Henrietta struggling helplessly in the grip of the monster, unable to escape from its carnivorous clutches. Why, it would be the perfect crime. The distraught nephew would arrive on the scene too late to be of assistance, and when the police answered his frantic call they would see at a glance that the whole affair was a deplorable accident. True, there would be an inquest, but the coroner's censure would be toned down in view of Hercules' obvious grief . . .

The more he thought of the idea, the more he liked it. He could see no flaws, as long as the orchid co-operated. That, clearly, would be the greatest problem. He would have to plan a course of training for the creature. It already looked sufficiently diabolical; he must give it a disposition to suit its appearance. Considering that he had no prior experience in such matters,
and that there were no authorities he could consult, Hercules proceeded along very sound and businesslike lines. He would use a fishing rod to dangle pieces of meat just outside the orchid's range, until the creature lashed its tentacles in a frenzy. At such times its high-pitched squeak was clearly audible, and Hercules wondered how it managed to produce the sound. He also wondered what its organs of perception were, but this was yet another mystery that could not be solved without close examination. Perhaps Aunt Henrietta, if all went well, would have a brief opportunity of discovering these interesting facts-though she would probably be too busy to report them for the benefit of posterity.

There was no doubt that the beast was quite powerful enough to deal with its intended victim. It had once wrenched a broomstick out of Hercules' grip, and although that in itself proved very little, the sickening "crack" of the wood a moment later brought a smile of satisfaction to its trainer's thin lips. He began to be much more pleasant and attentive to his aunt. In every respect, indeed, he was the model nephew.

When Hercules considered that his picador tactics had brought the orchid into the right frame of mind, he wondered if he should test it with live bait. This was a problem that worried him for some weeks, during which time he would look speculatively at every dog or cat he passed in the street, but he finally abandoned the idea, for a rather peculiar reason. He was simply too kind-hearted to put it into practice. Aunt Henrietta would have to be the first victim.

He starved the orchid for two weeks before he put his plan into action. This was as long as he dared risk-he did not wish to weaken the beast-merely to whet its appetite, that the outcome of the encounter might be more certain. And so, when he had carried the tea-cups back into the kitchen and was sitting upwind of Aunt Henrietta's cigar, he said casually: "I've got something I'd like to show you, auntie. I've been keeping it as a surprise. It'll. tickle you to death."

That, he thought, was not a completely accurate description, but it gave the general idea.

Auntie took the cigar out of her mouth and looked at Hercules
with frank surprise.

I "Well!" she boomed. "Wonders will never cease! What have

you been up to, you rascal?" She slapped him playfully on the back and shot all the air out of his lungs.

"You'll never believe it," gritted Hercules, when he had recovered his breath. "It's in the observatory."

"Eh?" said Auntie, obviously puzzled.

"Yes-come along and have a look. It's going to create a real sensation."

Auntie gave a snort that might have indicated disbelief, but followed Hercules without further question. The two Alsatians now busily chewing up the carpet looked at her anxiously and half rose to their feet, but she waved them away.

"All right, boys," she ordered gruffly. "I'll be back in a minute." Hercules thought this unlikely.
It was a dark evening, and the lights in the conservatory were off. As they entered, Auntie snorted, "Gad, Hercules-the place smells like a slaughter-house. Haven't met such a stink since I shot that elephant in Bulawayo and we couldn't find it for a week."
"Sorry, auntie," apologized Hercules, propelling her forward through the gloom. "It's a new fertilizer I'm using. It produces the most stunning results. Go on-another couple of yards. I want this to be a real surprise."
"I hope this isn't a joke," said Auntie suspiciously, as she stomped forward.
"I can promise you it's no joke," replied Hercules, standing with his hand on the light switch. He could just see the looming bulk of the orchid: Auntie was now within ten feet of it. He waited until she was well inside the danger zone, and threw the switch.
There was a frozen moment while the scene was transfixed with light. Then Aunt Henrietta ground to a halt and stood, arms akimbo, in front of the giant orchid. For a moment Hercules was afraid she would retreat before the plant could get into action: then he saw that she was calmly scrutinizing it, unable to make up her mind what the devil it was.
It was a full five seconds before the orchid moved. Then the dangling tentacles flashed into action-but not in the way that Hercules had expected. The plant clutched them tightly, protectively, around itself-and at the same time it gave a high-pitched scream of pure terror. In a moment of sickening disillusionment, Hercules realized the awful truth.
His orchid was an utter coward. It might be able to cope with the wild life of the Amazon jungle, but coming suddenly upon Aunt Henrietta had completely broken its nerve.
As for its proposed victim, she stood watching the creature with an astonishment which swiftly changed to another emotion. She spun around on her heels and pointed an accusing finger at her nephew.
"Hercules!" she roared. "The poor thing's scared to death. Have you been bullying it?"
Hercules could only stand with his head hanging low in shame and frustration.
"N-no, auntie," he quavered. "I guess it's naturally nervous."
"Well, I'm used to animals. You should have called me before. You must treat them firmly-but gently. Kindness always works, as long as you show them you're the master. There, there, did-dums don't be frightened of auntie-she won't hurt you . . ."
It was, thought Hercules in his blank despair, a revolting sight. With surprising gentleness, Aunt Henrietta fussed over the beast, patting and stroking it until the tentacles relaxed and the shrill, whistling scream died away. After a few minutes of this pandering, it appeared to get over its fright. Hercules finally fled with a muffled sob when one of the tentacles crept forward and began to stroke Henrietta's gnarled fingers . . .
From that day, he was a broken man. What was worse, he could never escape from the consequences of his intended crime. Henrietta had acquired a new pet, and was liable to call not only at weekends but two or three times in between as well. It was obvious that she did not trust Hercules to treat the orchid properly, and still suspected him of -bullying it. She would bring tasty tidbits that even her dogs had rejected, but which the orchid accepted with delight. The smell, which had so far been confined to the conservatory, began to creep into the house . . .
And there, concluded Harry Purvis, as he brought this improbable narrative to a close, the matter rests-to the satisfaction of two, at any rate, of the parties concerned. The orchid is happy, and Aunt Henrietta has something (query, someone?) else to dominate. From time to time the creature has a nervous breakdown when a mouse gets loose in the conservatory, and she rushes to console it.
As for Hercules, there is no chance that he will ever give any

more trouble to either of them. He seems to have sunk into a kind of vegetable sloth: indeed, said Harry thoughtfully, every day he becomes more and more like an orchid himself. The harmless variety, of course . . . .

THE SENTINEL

Arthur C. Clarke

The next time you see the full moon high in the south, look carefully at its right-hand edge and let your eye travel upward along the curve of the disk. Round about two o'clock you will notice a small, dark oval: anyone with normal eyesight can find it quite easily. It is the great walled plain, one of the finest on the Moon, known as the Mare Crisium-the Sea of Crises. Three hundred miles in diameter, and almost completely surrounded by a ring of magnificent mountains, it had never been explored until we entered it in the late summer of 1996.

Our expedition was a large one. We had two heavy freighters which had flown our supplies and equipment from the main lunar base in the Mare Serenitatis, five hundred miles away. There were also three small rockets which were intended for short-range transport over regions which our surface vehicles couldn't cross.

Luckily, most of the Mare Crisiurn is very flat. There are none of the great crevasses so common and so dangerous elsewhere, and very few craters or mountains of any size. As far as we could tell, our powerful caterpillar tractors would have no difficulty in taking us wherever we wished to go.

I was geologist-or selenologist, if you want to be pedantic in charge of. the group exploring the southern region of the Mare. We had crossed a hundred miles of it in a week, skirting the foothills of the mountains along the shore of what was once the ancient sea, some thousand million years before. When life was beginning on Earth, it was already dying here. The waters were retreating down the flanks of those stupendous cliff s, retreating into the empty heart of the Moon. Over the land which we were crossing, the tideless

ocean had once been half a mile deep, and now the only trace of moisture was the hoarfrost one could sometimes find in caves which the searing sunlight never penetrated.

We had begun our journey early in the slow lunar dawn, and still had almost a week of Earth-time before nightfall. Half a dozen times a day we would leave our vehicle and go outside in the spacesuits to hunt for interesting minerals, or to place markers for the guidance of future travelers. It was an uneventful routine. There is nothing hazardous or even particularly exciting about lunar exploration. We could live comfortably for a month in our pressurized tractors, and if we ran into trouble we could always radio for help and sit tight until one of the spaceships came to our rescue.

I said just now that there was nothing exciting about lunar exploration, but of course that isn't true. One could never grow tired of those incredible mountains, so much more rugged than the gentle hills of Earth. We never knew, as we rounded the capes and promontories of that vanished sea, what new splendors would be revealed to us. The whole southern curve of the Mare Crisiurn is a vast delta where a score of rivers once found their way into the ocean, fed perhaps by the torrential rains that must have lashed the mountains in the brief volcanic age when the Moon was young. Each of these ancient valleys was an invitation, challenging us to climb into the unknown uplands beyond. But we had a hundred miles still to cover, and could only look longingly at the heights which others must scale.

We kept Earth-time aboard the tractor, and precisely at 22.00 hours the final radio message would be sent out to Base and we would close down for the day. Outside, the rocks would still be burning beneath the almost vertical sun, but to us it was

night until we awoke again eight hours later. Then one of us would prepare breakfast, there would be a great buzzing of electric razors, and someone would switch on the short-wave radio from Earth. Indeed, when the smell of frying sausages began to fill the cabin, it was sometimes hard to believe that we were not back on our own world -everything was so normal and homely, apart from the feeling of decreased weight and the unnatural slowness with which objects fell.

It was my turn to prepare breakfast in the corner of the main cabin that served as a galley. I can remember that moment quite vividly after all these years, for the radio had just played one of my favorite melodies, the old Welsh air, "David of the White, Rock."

Our driver was already outside in his space-suit, inspecting our caterpillar treads. My assistant, Louis Garnett, was up forward in the control position, making some belated entries in yesterday's log.

As I stood by the frying pan waiting, like any terrestrial housewife, for the sausages to brown, I let my gaze wander idly over the mountain walls which covered the whole of the southern horizon, marching out of sight to east and west below the curve of the Moon. They seemed only a mile or two from the tractor, but I knew that the nearest was twenty miles away. On the Moon, of course, there is no loss of detail with distance-none of that almost imperceptible haziness which softens and sometimes transfigures all far-off things on Earth.

Those mountains were ten thousand feet high, and they climbed steeply out of the plain as if ages ago some subterranean eruption had smashed them skyward through the molten crust. The base of even the nearest was hidden from sight by the steeply curving surface of the plain, for the Moon is a very little world, and from where I was standing the horizon was only two miles away.

I lifted my eyes toward the peaks which no man had ever climbed, the peaks which, before the coming of terrestrial life, had watched the retreating oceans sink sullenly into their graves, taking with them the hope and the morning promise of a world. The sunlight was beating against those ramparts with a glare that hurt the eyes, yet only a little way above them the stars were shining steadily in a sky blacker than a winter midnight on Earth.

I was turning away when my eye caught a metallic glitter high on the ridge of a great promontory thrusting out into the sea thirty miles to the west. It was a dimensionless point of light, as if a star had been clawed from the sky by one of those cruel peaks, and I imagined that some smooth rock surface was catching the sunlight and heliographing it straight into my eyes. Such things were not uncommon. When the Moon is in her second quarter, observers on Earth can sometimes see the great ranges in the Oceanus Procellarum burning with a blue-white iridescence as the sunlight flashes from their slopes and leaps again from world to world. But I was curious to know what kind of rock could be shining so brightly up there, and I climbed into the observation turret and swung our four inch telescope round to the west.

I could see just enough to tantalize me. Clear and sharp in the

field of vision, the mountain peaks seemed only half a mile away, but whatever was catching the sunlight was still too small to be resolved. Yet it seemed to have an elusive symmetry, and the summit upon which it rested was curiously flat. I stared for a long time at that glittering enigma, straining my eyes into space, until presently a smell of burning from the galley told me that our breakfast sausages had made their quarter-million mile journey in vain. .

All that morning we argued our way across the Mare Crisium while the western mountains reared higher in the sky. Even when we were out prospecting in the space-suits, the discussion would continue over the radio. It was absolutely certain, my companions argued, that there had never been any form of intelligent life on the Moon. The only living things that had ever existed there were a few primitive plants and their slightly less degenerate ancestors. I knew that as well as anyone, but there are times when a scientist must not be afraid to make a fool of himself.

"Listen," I said at last, "I'm going up there, if only for my own peace of mind. That mountain's less than twelve thousand feet high -that's only two thousand under

Earth gravity-and I can make the trip in twenty hours at the outside. I've always wanted to go up into those hills, anyway, and this gives me an excellent excuse."
"If you don't break your neck," said Garnett, "you'll be the laughing-stock of the expedition when we get back to Base. That mountain will probably be called Wilson's Folly from now on."
"I won't break my neck," I said firmly. "Who was the first man to climb Pico and Helicon?"
"But weren't you rather younger in those days?" asked Louis gently.
"That," I said with great dignity, "is as good a reason as any for going."
We went to bed early that night, after driving the tractor to within half a mile of the promontory. Garnett was coming with me in the morning; he was a good climber, and had often been with me on such exploits before. Our driver was only too glad to be left in charge of the machine.
At first sight, those cliffs seemed completely unscalable, but to anyone with a good head for heights, climbing is easy on a world where all weights are only a sixth of their normal value. The real danger in lunar mountaineering lies in overconfidence; a six-
hundred-foot drop on the Moon can kill you just as thoroughly as a. hundred-foot fall on Earth.
We made our first halt on a wide ledge about four thousand feet above the plain. Climbing had not been very difficult, but my limbs were stiff with the unaccustomed effort, and I was glad of the rest. We could still see the tractor as a tiny metal insect far down at the foot of the cliff, and we reported our progress to the driver before starting on the next ascent.
Inside our suits it was comfortably cool, for the refrigeration units were fighting the fierce sun and carrying away the body-heat of our exertions. We seldom spoke to each other, except to pass climbing instructions and to discuss our best plan of ascent. I do not know what Garnett was thinking, probably that this was the craziest goose-chase he had ever embarked upon. I more than half agreed with him, but the joy of climbing, the knowledge that no man had ever gone this way before and the exhilaration of the steadily widening landscape gave me all the reward I needed.
I don't think I was particularly excited when I saw in front of us the wall of rock I had first inspected through the telescope from thirty miles away. It would level off about fifty feet above our heads, and there on the plateau would be the thing that had lured me over these barren wastes. It was, almost certainly, nothing more than a boulder splintered ages ago by a falling meteor, and with its cleavage planes still fresh and bright in this incorruptible, unchanging silence.
There were no hand-holds on the rock face, and we had to use a grapnel. My tired arms seemed to gain new strength as I swung the three-pronged metal anchor round my head and sent it sailing Lip toward the stars. The first time it broke loose and came falling slowly back when we pulled the rope. On the third attempt, the prongs gripped firmly and our combined weights could not shift it.
Garnett looked at me anxiously. I could tell that he wanted to go first, but I smiled back at him through the glass of my helmet and shook my head. Slowly, taking my time, I began the final ascent.
Even with my space-suit, I weighed only forty pounds here, so I pulled myself up hand over hand without bothering to use my feet. At the rim I paused and waved to my companion, then I scrambled over the edge and stood upright, staring ahead of me.

You must understand that until this very moment I had been almost completely convinced that there could be nothing strange or unusual for me to find here. Almost, but not quite; it was that haunting doubt that had driven me forward. Well, it was a doubt no longer, but the haunting had scarcely begun.
I was standing on a plateau perhaps a hundred feet across. It had once been smooth-too smooth to be natural-but falling meteors had pitted and scored its surface through immeasurable eons. It had been leveled to support a glittering, roughly

pyramidal structure, twice as high as a man, that was set in the rock like a gigantic, many-faceted jewel.

Probably no emotion at all filled my mind in those first few seconds. Then I felt a great lifting of my heart, and a strange, inexpressible joy. For I loved the Moon, and now I knew that the creeping moss of Aristarchus and Eratosthenes was not the only life she had brought forth in her youth. The old, discredited dream of the first explorers was true. There had, after all, been a lunar civilization-and I was the first to find it. That I had come perhaps a hundred million years too late did not distress me; it was enough to have come at all.

My mind was beginning to function normally, to analyze and to ask questions. Was this a building, a shrine-or something for which my language had no name? If a building, then why was it erected in so uniquely inaccessible a spot? I wondered if it might be a temple, and I could picture the adepts of some strange priesthood calling on their gods to preserve them as the life of the Moon ebbed with the dying oceans, and calling on their gods in vain.

I took a dozen steps forward to examine the thing more closely, but some sense of caution kept me from going too near. I knew a little of archaeology, and tried to guess the cultural level of the civilization that must have smoothed this mountain and raised the glittering mirror surfaces that still dazzled my eyes.

The Egyptians could have done it, I thought, if their workmen had possessed whatever strange materials these far more ancient architects had used. Because of the thing's smallness, it did not occur to me that I might be looking at the handiwork of a race more advanced than my own. The idea that the Moon had possessed intelligence at all was still almost too tremendous to grasp, and my pride would not let me take the final, humiliating plunge.

And then I noticed something that set the scalp crawling at the back of my neck-something so trivial and so innocent that many would never have noticed it at all. I have said that the plateau was scarred by meteors; it was also coated inches-deep with the cosmic dust that is always filtering down upon the surface of any world where there are no winds to disturb it. Yet the dust and the meteor scratches ended quite abruptly in a wide circle enclosing the little pyramid, as though an invisible wall was protecting it from the ravages of time and the slow but ceaseless bombardment from space.

There was someone shouting in my earphones, and I realized that Garnett had been calling me for some time. I walked unsteadily to the edge of the cliff and signaled him to join me, not trusting myself to speak. Then I went back toward that circle in the dust. I picked up a fragment of splintered rock and tossed it gently toward the shining enigma. If the pebble had vanished at that invisible barrier I should not have been surprised, but it seemed to hit a smooth, hemispherical surface and slide gently to the ground.

I knew then that I was looking at nothing that could be matched in the antiquity of my own race. This was not a building, but a machine, protecting itself with forces that had challenged Eternity. Those forces, whatever they might be, were still operating, and perhaps I had already come too close. I thought of all the radiations man had trapped and tamed in the past century. For all I knew, I might be as irrevocably doomed as if I had stepped into the deadly, silent aura of an unshielded atomic pile.

I remember turning then toward Garnett, who bad joined me and was now standing motionless at my side. He seemed quite oblivious to me, so I did not disturb him but walked to the edge of the cliff in an effort to marshal my thoughts. There below me lay the Mare Crisium-Sea of Crises, indeed-strange and weird to most men, but reassuringly familiar to me. I lifted my eyes toward the crescent Earth, lying in her cradle of stars, and I wondered what her clouds had covered when these unknown builders had finished their work. Was it the steaming jungle of the Carboniferous, the bleak shoreline over which the first amphibians must crawl to conquer the land-or, earlier still, the long loneliness before the coming of life?

Do not ask me why I did not guess the truth sooner-the truth,

that seems so obvious now. In the first excitement of my discovery, I had assumed without question that this crystalline apparition had been built by some race belonging to the Moon's remote past, but suddenly, and with overwhelming force, the belief came to me that it was as alien to the Moon as I myself.

In twenty years we had found no trace of life but a few degenerate plants. No lunar civilization, whatever its doom, could have left but a single token of its existence.

I looked at the shining pyramid again, and the more remote it seemed from anything that had to do with the Moon. And suddenly I felt myself shaking with a foolish, hysterical laughter, brought on by excitement and overexertion: for I had imagined that the little pyramid was speaking to me and was saying: "Sorry, I'm a stranger here myself."

It has taken us twenty years to crack that invisible shield and to reach the machine inside those crystal walls. What we could not understand, we broke at last with the savage might of atomic power and now I have seen the fragments of the lovely, glittering thing I found up there on the mountain.

They are meaningless. The mechanisms-if indeed they are mechanisms-of the pyramid belong to a technology that lies far beyond our horizon, perhaps to the technology of para-physical forces.

The mystery haunts us all the more now that the other planets have been reached and we know that only Earth has ever been the home of intelligent life in our Universe. Nor could any lost civilization of our own world have built that machine, for the thickness of the meteoric dust on the plateau has enabled us to measure its age. It was set there upon its mountain before life had emerged from the seas of Earth.

When our world was half its present age, something from the stars swept through the Solar System, left this token of its passage, and went again upon its way. Until we destroyed it, that machine was still fulfilling the purpose of its builders; and as to that purpose, here is my guess.

Nearly a hundred thousand million stars are turning in the circle of the Milky Way, and long ago other races on the worlds of other suns must have scaled and passed the heights that we have reached. Think of such civilizations, far back in time against the fading afterglow of Creation, masters of a universe so young that life as yet

had come only to a handful of worlds. Theirs would have been a loneliness we cannot imagine, the loneliness of gods looking out across infinity and finding none to share their thoughts.

They must have searched the star-clusters as we have searched the planets. Everywhere there would be worlds, but they would be empty or peopled with crawling, mindless things. Such was our own Earth, the smoke of the great volcanoes still staining the skies, when that first ship of the peoples of the dawn came sliding in from the abyss beyond Pluto. It passed the frozen outer worlds, knowing that life could play no part in their destinies. It came to rest among the inner planets, warming themselves around the fire of the Sun and waiting for their stories to begin.

Those wanderers must have looked on Earth, circling safely in the narrow zone between fire and ice, and must have guessed that it was the favorite of the Sun's children. Here, in the distant future, would be intelligence; but there were countless stars before -them still, and they might never come this way again.

So they left a sentinel, one of millions they have scattered throughout the Universe, watching over all worlds with the promise of life. It was a beacon that down the ages has been patiently signaling the fact that no one had discovered it.

Perhaps you understand now why that crystal pyramid was set upon the Moon instead of on the Earth. Its builders were not concerned with races still struggling up from savagery. They would be interested in our civilization only if we proved our fitness to survive -by crossing space and so escaping from the Earth, our cradle. That is the challenge that all intelligent races must meet, sooner or later. It is a double challenge, for it depends in turn upon the conquest of atomic energy and the last choice between life and death.

Once we had passed that crisis, it was only a matter of time before we found the pyramid and forced it open. Now its signals have ceased, and those whose duty it is will be turning their minds upon Earth. Perhaps they wish to help our infant civilization. But they must be very, very old, and the old are often insanely jealous of the young.

I can never look now at the Milky Way without wondering from which of those banked clouds of stars the emissaries are coming. If you will pardon so commonplace a simile, we have set off the fire-alarm and have nothing to do but to wait.

I do not think we will have to wait for long.

Silence Please

Arthur C. Clarke
1954 Popular Publications Inc.

You come upon the "White Hart" quite unexpectedly in one of these anonymous little lanes leading down from Fleet Street to the Embankment. It's no use telling you where it is: very few people who have set out in a determined effort to get there have ever actually arrived. For the first dozen visits a guide is essential: after that you'll probably be all right if you close your eyes and rely on instinct. Also-to be perfectly frank-we don't want any more customers, at least on our night. The place is already uncomfortably crowded. All that I'll say about its location is that it shakes occasionally with the vibration of newspaper presses, and that if you crane out of the window of the gents' room you can just see the Thames.

From the outside, it looks like any other pub-as indeed it is for five days of the week. The public and saloon bars are on the ground floor: there are the usual vistas of brown oak paneling and frosted glass, the bottles behind the bar, the handles of the beer engines . . . nothing out of the ordinary at all. Indeed, the only concession to the twentieth century is the juke box in the public bar. It was installed during the war in a laughable attempt to make G.I.'s feel at home, and one of the first things we did was to make sure there was no danger of its ever working again.

At this point I had better explain who "we" are. That is not as easy as I thought it was going to be when I started, for a complete catalogue of the "White Hart's" clients would probably be impossible and would certainly be excruciatingly tedious. So all I'll say at this point is that "we" fall into three main classes. First there. are the journalists, writers and editors. The journalists, of course,

gravitated here from Fleet Street. Those who couldn't make the grade fled elsewhere: the tougher ones remained. As for the writers ' most of them heard about us from other writers, came here for copy, and got trapped.

Where there are writers, of course, there are sooner or later editors. If Drew, our landlord, got a percentage on the literary business done in his bar, he'd be a rich man. (We suspect he is a rich man, anyway.) One of our wits once remarked that it was a common sight to see half a dozen indignant authors arguing with a hard faced editor in one corner of the "White Hart", while in another, half a dozen indignant editors argued with a hard-faced author.

So much for the literary side: you will have, I'd better warn you, ample opportunities for close-ups later. Now let us glance briefly at the scientists. How did they get in here?

Well, Birkbeck College is only across the road, and King's is just a few hundred yards along the Strand. That's doubtless part of the explanation, and again personal recommendation had a lot. to do with it. Also, many of our scientists are writers, and not a few of our writers are scientists. Confusing, but we like it that way.

The third portion of our little microcosm consists of what may be loosely termed "interested laymen". They were attracted to the "White Hart" by the general brouhaha, and enjoyed the conversation and company so much that they now come along regularly every Wednesday-which is the day when we all get together. Sometimes they can't stand the pace and fall by the wayside, but there's always a fresh supply.

With such potent ingredients, it is hardly surprising that Wednesday at the "White Hart" is seldom dull. Not only have some remarkable stories been told there, but remarkable things have happened there. For example, there was the time when Professor --, passing through on his way to Harwell, left behind a brief-case containing-well, we'd better not go into that, even though we did so at the time.

And most interesting it was, too . . . . Any Russian agents will find me in the corner under the dartboard. I come high, but easy terms can be arranged.
Now that I've finally thought of the idea, it seems astonishing to me that none of my colleagues has ever got round to writing up these stories. Is it a question of being so close to the wood that they can't see the trees? Or is it lack of incentive? No, the last
explanation can hardly hold: several of them are quite as hard up as I am, and have complained with equal bitterness about Drew's "NO CREDIT" rule. My only fear, as I type these words on my old Remington Noiseless, is that John Christopher or George Whitley or John Beynon are already hard at work using up the best material. Such as, for instance, the story of the Fenton Silencer . . . .
I don't know when it began: one Wednesday is much Re another and it's hard to tag dates on to them. Besides, people may spend a couple of months lost in the "White Hart" crowd before you first notice their existence. That had probably happened to Harry Purvis, because when 1. first came aware of him he already knew the names of most of the people in our crowd. Which is more than I do these days, now that I come to think of it.
But though I don't know when, I know exactly how it all started. Bert Huggins was the catalyst, or, to be more accurate, his voice was. Bert's voice would catalyse anything. When he indulges in a confidential whisper, it sounds like a sergeant major drilling an entire regiment. And when he lets himself go, conversation languishes elsewhere while we all. wait for those cute little bones in the inner ear to resume their accustomed places.
He had just lost his temper with John Christopher (we all do this at some time or other) and the resulting detonation had disturbed the chess game in progress at the back of the saloon bar. As usual, the two players were surrounded by backseat drivers, and we all looked up with a start as Bert's blast whammed overhead. When the echoes died away, someone said: "I wish there was a way of shutting him up."
It was then that Harry Purvis replied: "There is, you know."
Not recognizing the voice, I looked round. I saw a small, neatly dressed man in the late thirties. He was smoking one of those carved German pipes that always make me think of cuckoo clocks and the Black Forest. That was the only unconventional thing about him: otherwise he might have been a minor Treasury official all dressed up to go to a meeting of the Public Accounts Committee.
"I beg your pardon?" I said.
He took no notice, but made some delicate adjustments to his pipe. It was then that I noticed that it wasn't, as I'd thought at

first glance, an elaborate piece of wood carving. It was something much more sophisticated-a contraption of metal and plastic like a small chemical engineering plant. There were even a couple of minute, valves. My God, it was a chemical engineering plant . . . .
I don't goggle any more easily than the next man, but I made no attempt to hide my curiosity. He gave me a superior smile.
"All for the cause of science. It's an idea of the Biophysics Lab. They want to find out exactly what there is in tobacco smoke hence these filters. You know the old argument-does smoking cause cancer of the tongue, and if so, how? The trouble is that it takes an awful lot of-er-distillate to identify some of the obscurer by-products. So we have to do a lot of smoking."
"Doesn't it spoil the pleasure to have all this plumbing in the way?"
"I don't know. You see, I'm just a volunteer. I don't smoke."
"Oh," I said. For the moment, that seemed the only reply. Then I remembered how the conversation had started.
"You were saying," I continued with some feeling, for there was still a slight tintinus in my left ear, "that there was some way of shutting up Bert. We'd all like to hear it-if that isn't mixing metaphors somewhat."
"I was thinking," he replied, after a couple of experimental sucks and blows, "of the ill-fated Fenton Silencer. A sad story yet, I feel, one with an interesting

lesson for us all. And one day who knows?-someone may perfect it and earn the blessings of the world.
Suck, bubble ' bubble, plop . . . .
"Well, let's hear the story. When did it happen?"
He sighed.
"I'm almost sorry I mentioned it. Still, since you insist-and, of course, on the understanding that it doesn't go beyond these walls."
"Er-of course."
"Well, Rupert Fenton was one of our lab assistants. A very bright youngster, with a good mechanical background, but, naturally, not very well up in theory. He was always making gadgets in his spare time. Usually the idea was good, but as he was shaky on fundamentals the things hardly ever worked. That didn't-seem to discourage him: I think he fancied himself as a latter-day Edison, and imagined he could make his fortune from the radio tubes and
other oddments lying around the lab. As his tinkering didn't interfere with his work, no-one objected, indeed, the physics demonstrators did their best to encourage him, because, after all, there is something refreshing about any form of enthusiasm. But no-one expected he'd ever get very far, because I don't suppose he could even integrate e to the x."
as such ignorance possible?" gasped someone.
"Maybe I exaggerate. Let's say x e to the x. Anyway, all his knowledge was entirely practical-rule of thumb, you know. Give him a wiring diagram, however complicated, and he could make the apparatus for you. But unless it was something really simple, like a television set, he wouldn't understand how it worked. The trouble was, he didn't realize his limitations. And that, as you'll see, was most unfortunate.
"I think he must have got the idea while watching the Honours Physics students doing some experiments in acoustics. I take it, of course, that you all understand the phenomenon of interference,?"
"Naturally," I replied.
"Hey!" said one of the chess-players, who had given up trying to concentrate on the game (probably because he was losing). "I don't."
Purvis looked at him as though seeing something that had no right to be around in a world that had invented penicillin.
"In that case," he said coldly, "I suppose I had better do some
explaining." He waved aside our indignant protests. "No, I insist.
It's precisely those who don't understand these things who need to
be told about them. If someone had only explained the theory to
poor Fenton while there was ' s still time 1,
He looked down at the now thoroughly abashed chess-player.
"I do not know," he began, "if you have ever considered the nature of sound. Suffice to say that it consists of a series of waves moving through the air. Not, however, waves like those on the surface of the sea-oh dear no! Those waves are up and down movements. Sound waves consist of alternate compressions and rarefactions."
"Rare-what?"
"Rarefactions."
"Don't you mean 'rarefications'?"
"I do not. I doubt if such a word exists, and if it does, it

shouldn't," retorted Purvis, with the aplomb of Sir Alan Herbert dropping a particularly revolting neologism into his killing-bottle. "Where was I? Explaining sound, of course. When we make any sort of noise, from the faintest whisper to that concussion that went past just now, a series of pressure changes moves through the air. Have you ever watched shunting engines at work on a siding? You see a perfect example of the same kind of thing. There's a long line of goods-wagons, all coupled together. One end gets a bang, the first two trucks move together-and then you can see the compression wave moving right along the line. Behind it the reverse thing happens-the rarefaction-I repeat, rarefaction-as the trucks separate again.

"Things are simple enough when there is only one source of sound-only one set of waves. But suppose you have two wave patterns, moving in the same direction? That's when interference arises, and there are lots of pretty experiments in elementary physics to demonstrate it. All we need worry about here is, the fact-which I think you will all agree is perfectly obvious-that if one could get two sets of waves exactly out of step, the total result would be precisely zero. The compression pulse of one sound wave would be on top of the rarefaction of another-net result-no change and hence no sound. To go back to my analogy of the line of wagons, it's as if you gave the last truck a jerk and a push simultaneously. Nothing at all would happen.

"Doubtless some of you will already see what I am driving at, and will appreciate the basic principle of the Fenton Silencer. Young Fenton, I imagine, argued in this manner. 'This world of ours,' lit said to himself, 'is too full of noise. There would be a fortune for anyone who could invent a really perfect silencer. Now, what would that imply . . . T

"It didn't take him long to work out the answer: I told you he was a bright lad. There was really very little in his pilot model. It consisted of a microphone, a special amplifier, and a pair of loudspeakers. Any sound that happened to be about was picked up by the mike, amplified and inverted so that it was exactly out of phase with the original noise. Then it was pumped out of the speakers, the original wave and the new one cancelled out, and the net result was silence.

"Of course, there was rather more to it than that. There had
to be an arrangement to make sure that the canceling wave was just the right intensity-otherwise you might be worse off than when you started. But these are technical details that I won't bore you with. As many of you will recognize, it's a simple application of negative feed-back."

"Just a moment!" interrupted Eric Maine. Eric, I should mention, is an electronics expert and edits some television paper or other. He's also written a radio play about space-flight, but that's another story. "Just a moment! There's something wrong here. You couldn't get silence that way. It would be impossible to arrange the phase . . .

Purvis jammed the pipe back in his mouth. For a moment there was an ominous bubbling and I thought of the first act of "Macbeth". Then he fixed Eric with a glare.

"Are you suggesting," he said frigidly, "that this story is untrue?"

"Ah-well, I won't go as far as that, but Eric's voice trailed away as if he had been silenced himself. He pulled an old envelope out of his pocket, together with an assortment of resistors and condensers that seemed to have got entangled in his handkerchief, and began to do some figuring. That was the last we heard from him for some time.

"As I was saying," continued Purvis calmly, "that's the way Fenton's Silencer worked. His first model wasn't very powerful, and it couldn't deal with very high or very low notes. The result was rather odd. When it was switched on, and someone tried to talk, You'd hear the two ends of the spectrum-a faint bat's squeak, and a kind of low rumble. But he soon got over that by using a more linear circuit (dammit, I can't help using some technicalities!) and in the later model he was able to produce complete silence over quite a large area. Not merely an ordinary room, but a full-sized hall. Yes. . . .

"Now Fenton was not one of these secretive inventors who won't tell anyone what they are trying to do, in case their ideas are stolen. He was all too willing to talk. He discussed his ideas with the staff and with the students, whenever he could get anyone to listen. It so happened that one of the first people to whom he demonstrated his-improved Silencer was a young Arts student called -I think- Kendall, who was taking Physics as a subsidiary subject.

Kendall was much impressed by the Silencer, as well he might be. But he was not thinking, as you may have imagined, about its commercial possibilities, or the boon it would bring to the outraged ears of suffering humanity. Oh dear no! He had quite other ideas.

"Please permit me a slight digression. At college we have a flourishing Musical Society, which in recent years has grown in numbers to such an extent that it can now tackle the less monumental symphonies. In the year of which I speak, it was embarking on a very ambitious enterprise. It was going to produce a new opera, a work by a talented young composer whose name it would not be fair to mention, since it is now well-known to you all. Let us call him Edward England. I've forgotten the title of the work, but it was one of these stark dramas of tragic love which, for some reason I've never been able to understand, are supposed to be less ridiculous with a musical accompaniment than without. No doubt a good deal depends on the music.

"I can still remember reading the synopsis while waiting for the curtain to go up, and to this day have never been able to decide whether the libretto was meant seriously or not. Let's see-the period was the late Victorian era, and the main characters were Sarah Stampe, the passionate postmistress, Walter Partridge, the saturnine gamekeeper, and the squire's son, whose name I forget. It's the old story of the eternal triangle, complicated by the villager's resentment of change-in this case, the new telegraph system, which the local crones predict will Do Things to the cows' milk and cause trouble at lambing time.

"Ignoring the frills, it's the usual drama of operatic jealousy. The squire's son doesn't want to marry into the Post Office, and the gamekeeper, maddened by his rejection, plots revenge. The tragedy rises to its dreadful climax when poor Sarah, strangled with parcel tape, is found hidden in a mail-bag in the Dead Letter Department. The villagers hang Partridge from the nearest telegraph pole, much to the annoyance of the linesmen. He was supposed to sing an aria while he was being hung: that is one thing I regret missing. The squire's son takes to drink, or the Colonies, or both: and that's that.

"I'm sure you're wondering where all this is leading: please bear with me for a moment longer. The fact is that while this synthetic jealousy was being rehearsed, the real thing was going on back-
stage. Fenton's friend Kendall had been spurned by the young lady who was to play Sarah Stampe. I don't think he was a particularly vindictive person, but he saw an opportunity for a unique revenge. Let us be frank and admit that college life does breed a certain irresponsibility-and in identical circumstances, how many of us would have rejected the same chance?

"I see the dawning comprehension on your faces. But we, the audience, had no suspicion when the overture started on that memorable day. It was a most distinguished gathering: everyone was there, from the Chancellor downwards. Deans and professors were two a penny: I never did discover how so many people had been bullied into coming. Now that I come to think of it, I can't remember what I was doing there myself.

"The overture died away amid cheers, and, I must admit, occasional cat-calls from the more boisterous members of the audience. Perhaps I do them an injustice: they may have been the more musical ones.

"Then the curtain went up. The scene was the village square at Doddering Sloughleigh, circa 1860. Enter the heroine, reading the postcards in the morning's mail. She comes across a letter addressed to the young squire and promptly bursts into song.

"Sarah's opening aria wasn't quite as bad as the overture, but it was grim enough. Luckily, we were to hear only the first few bars . . . .

"Precisely. We need not worry about such details as how Kendall had talked the ingenuous Fenton into it-if, indeed, the inventor realized the use to which his device was being applied. All I need say is that it was a most convincing demonstration. There was a sudden, deadening blanket of silence, and Sarah Stampe just faded out like a TV program when the sound is turned off. Everyone was frozen in their seats, while the singer's lips went on moving silently. Then she too realized what had happened. Her mouth opened in what would have been a piercing scream in any other circumstances, and she fled into the wings amid a shower of postcards.

"Thereafter, the chaos was unbelievable. For a few minutes everyone must have thought they had lost the sense of hearing, but soon they were able to tell from the behavior of their companions that they were not alone in their deprivation. Someone in the Physics

Department must have realized the truth fairly promptly, for soon little slips of paper were circulating among the V.I.P.'s in the front row. The Vice-Chancellor was rash enough to try and restore order by sign-language, waving frantically to the audience from the stage. By this time I was too sick with laughter to appreciate such fine details.

"There was nothing for it but to get out of the hall, which we all did as quickly as we could. I think Kendall had fled-he was so overcome by the effect of the gadget that he didn't stop to switch it off. He was afraid of staying around in case he was caught and lynched. As for Fenton-alas, we shall never know his side of the story. We can only reconstruct the subsequent events from the evidence that was left.

"As I picture it, he must have waited until the hall was empty, and then crept in to disconnect his apparatus. We heard the explosion all over the college."

"The explosion?" someone gasped.

"Of course. I shudder to think what a narrow escape we all had. Another dozen decibels, a few more phones-and it might have happened while the theatre was still packed. Regard it, if you like, as an example of the inscrutable workings of providence that only the inventor was caught in the explosion. Perhaps it was as went: at least he perished in the moment of achievement, and before the Dean could get at him."

"Stop moralizing, man. What happened?"

"Well, I told you that Fenton was very weak on theory. If he'd gone into the mathematics of the Silencer he'd have found his mistake. The trouble is, you see, that one can't destroy energy. Not even when you cancel out one train of waves by another. All that happens then is that the energy you've neutralized accumulates somewhere else. It's rather Re sweeping up all the dirt in a room -at the cost of an unsightly pile under the carpet.

"When you look into the theory of the thing, you'll find that Fenton's gadget wasn't a silencer so much as a collector of sound ' All the time it was switched on, it was really absorbing sound energy. And at that concert, it was certainly going flat out. You'll understand what I mean if you've ever looked at one of Edward England's scores. On top of that, of course, there was all the noise the audience was making-or I should say was trying to make-

during the resultant panic. The total amount of energy must have been terrific, and the poor Silencer had to keep on sucking it up. Where did it go? Well, I don't know the circuit details-probably into the condensers of the power pack. By the time Fenton started to tinker with it again, it was like a loaded bomb. The sound of his approaching footsteps was the last straw, and the overloaded apparatus could stand no more. It blew up."

For a moment no-one said a word, perhaps as a token of respect for the late Mr. Fenton. Then Eric Maine, who for the last ten minutes had been muttering in the corner over his calculations, pushed his way through the ring of listeners. He held a sheet of paper thrust aggressively in front of him.

"Hey!" he said. "I was right all the time. The thing couldn't work. The phase and amplitude relations.

Purvis waved him away.

"That's just what I've explained," he said patiently. "You should have been listening. Too bad that Fenton found out the hard way."

He glanced at his watch. For some reason, he now seemed in a hurry to leave.

"My goodness! Time's getting on. One of these days, remind me to tell you about the extraordinary thing we saw through the new proton microscope. That's an even more remarkable story."

He was half way through the door before anyone else could challenge him. Then George Whitley recovered his breath.

"Look here," he said in a perplexed voice. "How is it that we never heard about this business?"
Purvis paused on the threshold, his pipe now burbling briskly as it got into its stride once more. He glanced back over his shoulder.
"There was only one thing to do," he replied. "We didn't want a scandal-de mortuis nil nisi bonum, you know. Besides, in the circumstances, don't you think it was highly appropriate to-a hush the whole business up? And a very good night to you all."

The Star

It is three thousand light-years to the Vatican. Once I believed that space could have no power over faith. Just as I believed that the heavens declared the glory of God's handiwork. Now I have seen that handiwork, and my faith is sorely troubled.

I stare at the crucifix that hangs on the cabin wall above the Mark VI computer, and for the first time in my life I wonder if it is no more than an empty symbol. I have told no one yet, but the truth cannot be concealed. The data are there for anyone to read, recorded on the countless miles of magnetic tape and the thousands of photographs we are carrying back to Earth. Other scientists can interpret them as easily as I can--more easily, in all probability. I am not one who would condone that tampering with the truth which often gave my order a bad name in the olden days.

The crew is already sufficiently depressed, I wonder how they will take this ultimate irony. Few of them have any religious faith, yet they will not relish using this final weapon in their campaign against me--that private, good-natured but fundamentally serious war which lasted all the way from Earth. It amused them to have a Jesuit as chief astrophysicist. Dr. Chandler, for instance, could never get over it (why are medical men such notorious atheists?). Sometimes he would meet me on the observation deck, where the lights are always low, so that the stars shine with undiminished glory. He would come up to me in the gloom and stand staring out of the great oval port, while the heavens crawled slowly round us as the ship turned end over end with the residual spin we had never bothered to correct.

"Well, Father," he would say at last. "It goes on forever and forever, and perhaps Something made it. But how you can believe that Something has a special interest in us and our miserable little world--that just beats me." Then the argument would start, while the stars and nebulae would swing around us in silent, endless arcs beyond the flawlessly clear plastic of the observation port. It was, I think, the apparent incongruity of my position which, yes, amused the crew. In vain I would point to my three papers in the Astrophysical Journal, my five in the Monthly Notices of the Royal Astronomical Society. I would remind them that our order has long been famous for its scientific works. We may be few now, but ever since the eighteenth century we have made contributions to astronomy and geophysics out of all proportion to our numbers.

Will my report on the Phoenix Nebula end our thousand years of history? It will end, I fear, much more than that. I do not know who gave the nebula its name, which seems to me a very bad one. If it contains a prophecy, it is one which cannot be verified for several thousand million years. Even the word "nebula" is misleading; this is a far smaller object than those stupendous clouds of mist--the stuff of unborn stars--which are scattered throughout the length of the Milky Way. On the cosmic scale, indeed, the Phoenix Nebula is a tiny thing--a tenuous shell of gas surrounding a single star. Or what is left of a star . . .

The Rubens engraving of Loyola seems to mock me as it hangs there above the spectrophotometer tracings. What would you, Father, have made of this knowledge that has come into my keeping, so far from the little world that was all the universe you knew? Would your faith have risen to the challenge, as mine has failed to do? You gaze into the distance, Father, but I have traveled a distance beyond any that you could have imagined when you founded our order a thousand years ago. No other survey ship has been so far from Earth: we are at the very frontiers of the explored universe. We set out to reach the Phoenix Nebula, we succeeded, and we are homeward bound with our burden of knowledge. I wish I could lift that burden from my shoulders, but I call to you in vain across the centuries and the light-years that lie between us. On the book you are holding the words are plain to read. "AD MAIOREM DEI GLORIAM," the message runs, but it is a message I can no longer believe. Would you still believe it if you could see what we have found?

We knew, of course, what the Phoenix Nebula was. Every year, in our galaxy alone, more than a hundred stars explode, blazing for a few hours or days with

thousands of times their normal brilliance before they sink back into death and obscurity. Such are the ordinary novae--the commonplace disasters of the universe. I have rocorded the spectrograms and light curves of dozens, since I started working at the lunar observatory. But three or four times in every thousand years occurs something beside which even a nova pales into total insignificance.

When a star becomes a supernova, it may for a little while outshine all the massed suns of the galaxy. The Chinese astronomers watched this happen in A.D. 1054, not knowing what it was they saw. Five centuries later, in 1572, a supernova blazed in Cassiopeia so brilliantly that it was visible in the daylight sky. There have been three more in the thousand years that have passed since then. Our mission was to visit the remnants of such a catastrophe, to reconstruct the events that led up to it, and, if possible, to learn its cause. We came slowly in through the concentric shells of gas that had been blasted out six thousand years before, yet were expanding still. They were immensely hot, radiating still with a fierce violet light, but far too tenuous to do us any damage. When the star had exploded, its outer layers had been driven upward with such speed that they had escaped completely from its gravitational field. Now they formed a hollow shell large enough to engulf a thousand solar systems, and at its center burned the tiny, fantastic object which the star had now become--a white dwarf, smaller than the Earth, yet weighing a million times as much. The glowing gas shells were all around us, banishing the normal night of interstellar space. We were flying into the center of a cosmic bomb that had detonated millennia ago and whose incandescent fragments were still hurtling apart. The immense scale of the explosion, and the fact that the debris already covered a volume of space many billions of miles across, robbed the scene of any visible movement. It would take decades before the unaided eye could detect any motion in these tortured wisps and eddies of gas, yet the sense of turbulent expansion was overwhelming. We had checked our primary drive hours before and were drifting slowly toward the fierce little star ahead. Once it had been a sun like our own, but it had squandered in a few hours the energy that should have kept it shining for a million years. Now it was a shrunken miser, hoarding its resources as if trying to make amends for its prodigal youth.

No one seriously expected to find planets. If there had been any before the explosion, they would have been boiled into puffs of vapor and their substance lost in the greater wreckage of the star itself. But we made the automatic search, as always when approaching an unknown sun, and presently we found a single small world circling the star at an immense distance. It must have been the Pluto of this vanished solar system, orbiting on the frontiers of the night. Too far from the central sun ever to have known life, its remoteness had saved it from the fate of all its lost com- panions.

The passing fires had seared its rocks and burned away the mantle of frozen gas that must have covered it in the days before the disaster. We landed, and we found the Vault.

Its builders had made sure that we should. The monolithic marker that stood above the entrance was now a fused stump, but even the first long-range photographs told us that here was the work of intelligence. A little later we detected the continent-wide pattern of radioactivity that had been buried in the rock. Even if the pylon above the Vault had been destroyed, this would have remained, an immovable and all but eternal beacon calling to the stars. Our ship fell toward this gigantic bull's-eye like an arrow into its target.

The pylon must have been a mile high when it was built, but now it looked like a candle that had melted down into a puddle of wax. It took us a week to drill through the fused rock, since we did not have the proper tools for a task like this. We were astronomers, not archaeologists, but we could improvise. Our original program was forgotten: this lonely monument, reared at such labor at the greatest possible distance from the doomed sun, could have only one meaning. A civilization which knew it was about to die had made its last bid for immortality.

It will take us generations to examine all the treasures that were placed in the Vault. They had plenty of time to prepare, for their sun must have given its first warnings many years before the final detonation. Everything that they wished

to preserve, all the fruits of their genius, they brought here to this distant world in the days before the end, hoping that some other race would find them and that they would not be utterly forgotten.

If only they had a little more time! They could travel freely enough between the planets of their own sun, but they had not yet learned to cross the interstellar gulfs, and the nearest solar system was a hundred light-years away. Even if they had not been so disturbingly human as their sculpture shows, we could not have helped admiring them and grieving for their fate. They left thousands of visual records and the machines for projecting them, together with elaborate pictorial instructions from which it will not be difficult to learn their written language. We have examined many of these records, and brought to life for the first time in six thousand years the warmth and beauty of a civilization which in many ways must have been superior to our own. Perhaps they only showed us the best, and one can hardly blame them. But their worlds were very lovely, and their cities were built with a grace that matches anything of ours. We have watched them at work and play, and listened to their musical speech sounding across the centuries. One scene is still before my eyes--a group of children on a beach of strange blue sand, playing in the waves as children play on Earth.

And sinking into the sea, still warm and friendly and life-giving, is the sun that will soon turn traitor and obliterate all this innocent happiness.

Perhaps if we had not been so far from home and so vulnerable to loneliness, we should not have been so deeply moved. Many of us had seen the ruins of ancient civilizations on other worlds, but they had never affected us so profoundly.

This tragedy was unique. It was one thing for a race to fail and die, as nations and cultures have done on Earth. But to be destroyed so completely in the full flower of its achievement, leaving no survivors--how could that be reconciled with the mercy of God?

My colleagues have asked me that, and I have given what answers I can. Perhaps you could have done better, Father Loyola, but I have found nothing in the Exercitia spiritualia that helps me here. They were not an evil people: I do not know what gods they worshiped, if indeed they worshiped any. But I have looked back at them across the centuries, and have watched while the loveliness they used their last strength to preserve was brought forth again into the light of their shrunken sun.

I know the answers that my colleagues will give when they get back to Earth. They will say that the universe has no purpose and no plan, that since a hundred suns explode every year in our galaxy, at this very moment some race is dying in the depths of space. Whether that race has done good or evil during its lifetime will make no difference in the end: there is no divine justice, for there is no God. Yet, of course, what we have seen proves nothing of the sort. Anyone who argues thus is being swayed by emotion, not logic. God has no need to justify His actions to man. He who built the universe can destroy it when He chooses. It is arrogance--it is perilously near blasphemy for us to say what He may or may not do.

This I could have accepted, hard though it is to look upon whole worlds and peoples thrown into the furnace. But there comes a point when even the deepest faith must falter, and now, as I look at my calculations, I know I have reached that point at last.

We could not tell, before we reached the nebula, how long ago the explosion took place. Now, from the astronomical evidence and the record in the rocks of that one surviving planet, I have been able to date it very exactly. I know in what year the light of this colossal conflagration reached Earth. I know how brilliantly the supernova whose corpse now dwindles behind our speeding ship once shone in terrestrial skies. I know how it must have blazed low in the East before sunrise, like a beacon in that Oriental dawn. There can be no reasonable doubt: the ancient mystery is solved at last. Yet O God, there were so many stars you could have used.

What was the need to give these people to the fire, that the symbol of their passing might shine above Bethlehem?

Superiority

Arthur C. Clarke

In making this statement-which I do of my own free will-I wish first to make it perfectly clear that I am not in any way trying to gain sympathy, nor do I expect any mitigation of whatever sentence the Court may pronounce. I am writing this in an attempt to refute some of the lying reports broadcast over the prison radio and published in the papers I have been allowed to see. These have given an entirely false picture of the true cause of our defeat, and as the leader of my race's armed forces at the cessation of hostilities I feel it my duty to protest against such libels upon those who served under me.

I also hope that this statement may explain the reasons for the application I have twice made to the Court, and will now induce it to grant a favor for which I can see no possible grounds of refusal.

The ultimate cause of our failure was a simple one: despite all statements to the contrary, it was not due to lack of bravery on the part of our men, or to any fault of the Fleet's. We were defeated by one thing only-by the inferior science of our enemies. I repeat-by the inferior science of our enemies.

When the war opened we had no doubt of our ultimate victory. The combined fleets of our allies greatly exceeded in number and armament those which the enemy could muster against us, and in almost all branches of military science we were their superiors. We were sure that we could maintain this superiority. Our belief proved, alas, to be only too well founded.

At the opening of the war our main weapons were the long-range homing torpedo, dirigible ball-lightning and the various modifications of the Klydon beam. Every unit of the Fleet was equipped with these and though the enemy possessed similar weapons their installations were generally of lesser power. Moreover, we had behind us a far greater military Research Organization, and with this initial advantage we could not possibly lose.

The campaign proceeded according to plan until the Battle of the Five Suns. We won this, of course, but the opposition proved stronger than we had expected. It was realized that victory might be more difficult, and more delayed, than had first been imagined. A conference of supreme commanders was therefore called to discuss our future strategy.

Present for the first time at one of our war conferences was Professor-General Norden, the new Chief of the Research Staff, who had just been appointed to fill the gap left by the death of Malvar, our greatest scientist. Malvar's leadership had been responsible, more than any other single factor, for the efficiency and power of our weapons. His loss was a very serious blow, but no one doubted the brilliance of his successor-though many of us disputed the wisdom of appointing a theoretical scientist to fill a post of such vital importance. But we had been overruled.

I can well remember the impression Norden made at that conference. The military advisers were worried, and as usual turned to the scientists for help. Would it be possible to improve our existing weapons, they asked, so that our present advantage could be increased still further?

Norden's reply was quite unexpected. Malvar had often been asked such a question-and he had always done what we requested.

"Frankly, gentlemen," said Norden, "I doubt it. Our existing weapons have practically reached finality. I don't wish to criticize my predecessor, or the excellent work done by the Research Staff in the last few generations, but do you realize that there has been no basic change in armaments for over a century? It is, I am afraid, the result of a tradition that has become conservative. For too

long, the Research Staff has devoted itself to perfecting old weapons instead of developing new ones. It is fortunate for us that our opponents have been no wiser: we cannot assume that this will always be so."

Norden's words left an uncomfortable impression, as he had no doubt intended. He quickly pressed home the attack.

"What we want are new weapons-weapons totally different from any that have been employed before. Such weapons can be made: it will take time, of course, but since assuming charge I have replaced some of the older scientists by young men and have directed, research into several unexplored fields which show great promise. I believe, in fact, that a revolution in warfare may soon be upon us."

We were skeptical. There was a bombastic tone in Norden's voice that made us suspicious of his claims. We did not know, then, that he never promised anything that he had not already almost perfected in the laboratory. In the laboratory-that was the operative phrase.

Norden proved his case less than a month later, when he demonstrated the Sphere of Annihilation, which produced complete disintegration of matter over a radius of several hundred meters. We were intoxicated by the power of the new weapon, and were quite prepared to overlook one fundamental defect-the fact that it was a sphere and hence destroyed its rather complicated generating equipment at the instant of formation. This meant, of course, that it could not be used on warships but only on guided missiles, and a great program was started to convert all homing torpedoes to carry the new weapon. For the time being all further offensives were suspended.

We realize now that this was our first mistake. I still think that it was a natural one, for it seemed to us then that all our existing weapons had become obsolete overnight, and we already regarded them as almost primitive survivals. What we did not appreciate was the magnitude of the task we were attempting, and the length of time it would take to get the revolutionary super-weapon into battle. Nothing like this had happened for a hundred years and we had no previous experience to guide us.

The conversion problem proved far more difficult than anticipated. A new class of torpedo had to be designed, as the standard model was too small. This meant in turn that only the larger ships could launch the weapon, but we were prepared to accept this penalty. After six months, the heavy units of the Fleet were being equipped with the Sphere. Training maneuvers and tests had shown that it was operating satisfactorily and we were ready to take it into
action. Norden was already being hailed as the architect of victory, and had half promised even more spectacular weapons.

Then two things happened. One of our battleships disappeared completely on a training flight, and an investigation showed that under certain conditions the ship's long-range radar could trigger the Sphere immediately it had been launched. The modification needed to overcome this defect was trivial, but it caused a delay of another month and was the source of much bad feeling between the naval staff and the scientists. We were ready for action again when Norden announced that the radius of effectiveness of the Sphere had now been increased by ten, thus multiplying by a thousand the chances of destroying an enemy ship.

So the modifications started all over again, but everyone agreed that the delay would be worth it. Meanwhile, however, the enemy had been emboldened by the absence of further attacks and had made an unexpected onslaught. Our ships were short of torpedoes, since none had been coming from the factories, and were forced to retire. So we lost the systems of Kyrane and Floranus, and the planetary fortress of Rhamsandron.

It was an annoying but not a serious blow, for the recaptured systems had been unfriendly, and difficult to administer. We had no doubt that we could restore the position in the near future, as soon as the new weapon became operational.

These hopes were only partially fulfilled. When we renewed our offensive, we had to do so with fewer of the Spheres of Annihilation than had been planned, and this was one reason for our limited success. The other reason was more serious.

While we had been equipping as many of our ships as we could with the irresistible weapon, the enemy had been building feverishly. His ships were of the old pattern with the old weapons-but they now outnumbered ours. When we went into action, we found that the numbers ranged against us were often 100 per cent greater than expected, causing target confusion among the automatic weapons and resulting in higher losses than anticipated. The enemy losses were higher still, for once a Sphere had reached its objective, destruction was certain, but the balance had not swung as far in our favor as we had hoped.
Moreover, while the main fleets had been engaged, the enemy had launched a daring attack on the lightly held systems of Eriston,

Duranus, Carmanidora and Pharanidon-recapturing them all. We were thus faced with a threat only fifty light-years from our home planets.
There was much recrimination at the next meeting of the supreme commanders. Most of the complaints were addressed to Norden-Grand Admiral Taxaris in particular maintaining that thanks to our admittedly irresistible weapon we were now considerably worse off than before. We should, he claimed, have continued to build conventional ships, thus preventing the loss of our numerical superiority.
Norden was equally angry and called the naval staff ungrateful bunglers. But I could tell that he was worried-as indeed we all were-by the unexpected turn of events. He hinted that there might be a speedy way of remedying the situation.
We now know that Research had been working on the Battle Analyzer for many years, but at the time it came as a revelation to us and perhaps we were too easily swept off our feet. Norden's argument, also, was seductively convincing. What did it matter, he said, if the enemy had twice as many ships as we-if the efficiency of ours could be doubled or even trebled? For decades the limiting factor in warfare had been not mechanical but biological-it had become more and more difficult for any single mind, or group of minds, to cope with the rapidly changing complexities of battle in three-dimensional space. Norden's mathematicians had analyzed some of the classic engagements of the past, and had shown that even when we had been victorious we had often operated our units at much less than half of their theoretical efficiency.
The Battle Analyzer would change all this by replacing the operations staff with electronic calculators. The idea was not new, in theory, but until now it had been no more than a utopian dream. Many of us found it difficult to believe that it was still anything but a dream: after we had run through several very complex dummy battles, however, we were convinced.
It was decided to install the Analyzer in four of our heaviest ships, so that each of the main fleets could be equipped with one. At this stage, the trouble began-though we did not know it until later.
The Analyzer contained just short of a million vacuum tubes and needed a team of five hundred technicians to maintain and
operate it. It was quite impossible to accommodate the extra staff aboard a battleship, so each of the four units had to be accompanied by a converted liner to carry the technicians not on duty. Installation was also a very slow and tedious business, but by gigantic efforts it was completed in six months.
Then, to Our dismay, we were confronted by another crisis. Nearly five thousand highly skilled men had been selected to serve the Analyzers and had been given an intensive course at the Technical Training Schools. At the end of seven months, 10 per cent of them had had nervous breakdowns and only 40 per cent had qualified.
Once again, everyone started to blame everyone else. Norden, of course, said that the Research Staff could not be held responsible, and so incurred the enmity of the Personnel and Training Commands. It was finally decided that the only thing to do was to use two instead of four Analyzers and to bring the others into action as soon as men could be trained. There was little time to lose, for the enemy was still on the offensive and his morale was rising.
The first Analyzer fleet was ordered to recapture the system of Eriston. On the way, by one of the hazards of war, the liner carrying the technicians was struck by

a roving mine. A warship would have survived, but the liner with its irreplaceable cargo was totally destroyed. So the operation had to be abandoned.
The other expedition was, at first, more successful. There was no doubt at all that the Analyzer fulfilled its designers' claims, and the enemy was heavily defeated in the first engagements. He withdrew, leaving us in possession of Saphran, Leucon and Hexanerax. But his Intelligence Staff must have noted the change in our tactics and the inexplicable presence of a liner in the heart of our battle_ fleet. It must have noted, also, that our first fleet had been accompanied by a similar ship-and had withdrawn when it had been destroyed.
In the next engagement, the enemy used his superior numbers to launch an overwhelming attack on the Analyzer ship and its unarmed consort. The attack was made without regard to losses both ships were, of course, very heavily protected-and it succeeded. The result was the virtual decapitation of the Fleet, since an effectual transfer to the old operational methods proved impossible. We disengaged under heavy fire, and so lost all our gains and also the

systems of Lormyia, Ismarnus, Beronis, Alphanidon and Sideneus. At this stage, Grand Admiral Taxaris expressed his disapproval of Norden by committing suicide, and I assumed supreme command.
The situation was now both serious and infuriating. With stubborn conservatism and complete lack of imagination, the enemy continued to advance with his old-fashioned and inefficient but now vastly more numerous ships. It was galling to realize that if we had only continued building, without seeking new weapons, we would have been in a far more advantageous position. There were many acrimonious conferences at which Norden defended the scientists while everyone else blamed them for all that had happened. The difficulty was that Norden had proved every one of his claims: he had a perfect excuse for all the disasters that had occurred. And we could not now turn back-the search for an irresistible weapon must go on. At first it had been a luxury that would shorten the war. Now it was a necessity if we were to end it victoriously.
We were on the defensive, and so was Norden. He was more than ever determined to re-establish his prestige and that of the Research Staff. But we had been twice disappointed, and would not make the same mistake again. No doubt Norden's twenty thousand scientists would produce many further weapons: we would remain unimpressed.
We were wrong. The final weapon was something so fantastic that even now it seems difficult to believe that it ever, existed. Its innocent, noncommittal name-The Exponential Field-gave no hint of its real potentialities. Some of Norden's mathematicians had discovered it during a piece of entirely theoretical research into the properties of space, and to everyone's great surprise their results were found to be physically realizable.
It seems very difficult to explain the operation of the Field to the layman. According to the technical description, it "produces an exponential condition of space, so that a finite distance in normal, linear space may become infinite in pseudo-space." Norden gave an analogy which some of us found useful. It was as if one took a flat disk of rubber-representing a region of normal space-and then pulled its center out to infinity. The circumference of the disk would be unaltered-but its "diameter" would be infinite. That was the sort of thing the generator of the Field did to the space around it.
As an example, suppose that a ship carrying the generator was surrounded by a ring of hostile machines. If it switched on the Field, each of the enemy ships would think that it-and the ships on the far side of the circle-had suddenly receded into nothingness. Yet the circumference of the circle would be the same as before: only the journey to the center would be of infinite duration, for as one proceeded, distances would appear to become greater and greater as the "scale" of space altered.
it was a nightmare condition, but a very useful one. Nothing could reach a ship carrying the Field: it might be englobed by an enemy fleet yet would be as inaccessible as if it were at the other side of the Universe. Against this, of

course, it could not fight back without switching off the Field, but this still left it at a very great advantage, not only in defense but in offense. For a ship fitted with the Field could approach an enemy fleet undetected and suddenly appear in its midst.

This time there seemed to be no flaws in the new weapon. Needless to say, we looked for all the possible objections before we committed ourselves again. Fortunately the equipment was fairly simple and did not require a large operating staff. After much debate, we decided to rush it into production, for we realized that time was running short and the war was going against us. We had now lost about the whole of our initial pins and enemy forces had made several raids into our own solar system. We managed to hold off the enemy while the Fleet was reequipped and the new battle techniques were worked out. To use the Field operationally it was necessary to locate an enemy formation, set a course that would intercept it, and then switch on the generator for the calculated period of time. On releasing the Field again-if the calculations had been accurate-one would be in the enemy's midst and could do great damage during the resulting confusion, retreating by the same route when necessary.

The first trial maneuvers proved satisfactory and the equipment seemed quite reliable. Numerous mock attacks were made and the crews became accustomed to the new technique. I was on one of the test flights and can vividly remember my impressions as the Field was switched on. The ships around us seemed to dwindle as if on the surface of an expanding bubble: in an instant they had vanished completely. So had the stars-but presently we could see

that the Galaxy was still visible as a faint band of light around the ship. The virtual radius of our pseudo-space was not really infinite but some hundred thousand light-years, and so the distance to the farthest stars of our system had not been greatly increased-though the nearest had of course totally disappeared. These training maneuvers, however, had to be cancelled before they were complete owing to a whole flock of minor technical troubles in various pieces of equipment, notably the communications circuits. These were annoying, but not important, though it was thought best to return to Base to clear them up.

At that moment the enemy made what was obviously intended to be a decisive attack against the fortress planet of Iton at the limits of our solar system. The Fleet had to go into battle before repairs could be made.

The enemy must have believed that we had mastered the secret of invisibility-as in a sense we had. Our ships appeared suddenly out of nowhere and inflicted tremendous damage-for a while. And then something quite baffling and inexplicable happened.

I was in command of the flagship Hircania when the trouble started. We had been operating as independent units, each against assigned objectives. Our detectors observed an enemy formation at medium range and the navigating officers measured its distance with great accuracy. We set course and switched on the generator.

The Exponential Field was released at the moment when we should have been passing through the center of the enemy group. To our consternation, we emerged into normal space at a distance of many hundred miles-and when we found the enemy, he had already found us. We retreated, and tried again. This time we were so far away from the enemy that he located us first.

Obviously, something was seriously wrong. We broke communicator silence and tried to contact the other ships of the Fleet to see if they had experienced the same trouble. Once again we failed -and this time the failure was beyond all reason, for the communication equipment appeared to be working perfectly. We could only assume, fantastic though it seemed, that the rest of the Fleet had been destroyed.

I do not wish to describe the scenes when the scattered units of the Fleet struggled back to Base. Our casualties had actually been negligible, but the ships were completely demoralized. Almost all
had lost touch with one another and had found that their ranging equipment showed inexplicable errors. It was obvious that the Exponential Field was the cause of the troubles, despite the fact that they were only apparent when it was switched off.

The explanation came too late to do us any good, and Norden's final discomfiture was small consolation for the virtual loss of the war. As I have explained, the Field generators produced a radial distortion of space, distances appearing greater and greater as one approached the center of the artificial pseudo-space. When the Field was switched off, conditions returned to normal.

But not quite. It was never possible to restore the initial state exactly. Switching the Field on and off was equivalent to an elongation and contraction of the ship carrying the generator, but there was an hysteretic effect, as it were, and the initial condition was never quite reproducible, owing to all the thousands of electrical changes and movements of mass aboard the ship while the Field was on. These asymmetries and distortions were cumulative, and though they seldom amounted to more than a fraction of one per cent, that was quite enough. It meant that the precision ranging equipment and the tuned circuits in the communication apparatus were thrown completely out of adjustment. Any single ship could never detect the change-only when it compared its equipment with that of another vessel, or tried to communicate with it, could it tell what had happened.

It is impossible to describe the resultant chaos. Not a single component of one ship could be expected with certainty to work aboard another. The very nuts and bolts were no longer interchangeable, and the supply position became quite impossible. Given time, we might even have overcome these difficulties, but the enemy ships were already attacking in thousands with weapons which now seemed centuries behind those that we had invented. Our magnificent Fleet, crippled by our own science, fought on as best it could until it was overwhelmed and forced to surrender. The ships fitted with the Field were still invulnerable, but as fighting units they were almost helpless. Every time they switched on their generators to escape from enemy attack, the permanent distortion of their equipment increased. In a month, it was all over.

This is the true story of our defeat, which I give without prejudice to my defense before this Court. I make it, as I have said, to counteract the libels that have been circulating against the men who fought under me, and to show where the true blame for our misfortunes lay.

Finally, my request, which as the Court will now realize, I make in no frivolous manner and which I hope will therefore be granted.

The Court will be aware that the conditions under which we are housed and the constant surveillance to which we are subjected night and day are somewhat distressing. Yet I am not complaining of this: nor do I complain of the fact that shortage of accommodation has made it necessary to house us in pairs.

But I cannot be held responsible for my future actions if I am compelled any longer to share my cell with Professor Norden, late Chief of the Research Staff of my armed forces.

Transience

By: Arthur C. Clarke

The forest, which came almost to the edge of the beach, climbed away into the distance up the flanks of the low, misty hills. Underfoot, the sand was course and mixed with myriads of broken shells. Here and there the retreating tide had left long streamers of weed trailed across the beach. The rain, which seldom ceased, had for the moment passed inland, but ever and again large, angry drops would beat tiny craters into the sand.

It was hot and sultry, for the war between sun and rain was never-ending. Sometimes the mists would lift for a while and the hills would stand out clearly above the land they guarded. The hills arced in a semicircle along the bay, following the line of the beach, and beyond them could sometimes be seen, at an immense distance, a wall of mountains lying beneath perpetual clouds. The trees grew everywhere, softening the contours of the land so that the hills blended smoothly into each other. Only in one place could the bare, uncovered rock be seen, where long ago some fault had weakened the foundations of the hills, so that for a mile or more the sky line fell sharply away, drooping down to the sea like a broken wing.

Moving with the cautious alertness of a wild animal, the child came through the stunted trees at the forest's edge. For a moment he hesitated; then, since there seemed to be no danger, walked slowly out onto the beach.

He was naked, heavily built, and had course black hair tangled over his shoulders. His face, brutish though it was, might almost have passed in human society, but the eyes would have betrayed him. They were not the eyes of an animal, for there was something in their depths that no animal had ever known. But it was no more than a promise. For this child, as for all his race, the light of reason had yet to dawn. Only a hairsbreadth still separated him from the beasts among whom he dwelt. The tribe had not long since come into this place, and he was the first ever to set foot upon the lonely beach. What had lured him from the known dangers of the forest into the unknown and therefore more terrible dangers of this new element. he could not have told even had he possessed the power of speech. Slowly he walked out to the water's edge, always with backward glances at the forest behind him; as he did so, for the first time in all history, the level sand bore upon its face the footprints it would one day know so well.

He had met water before, but it had always been bounded and confined by land. Now it stretched endlessly before him, and the sound of its labouring beat ceaselessly upon his ears.

With the timeless patience of the savage, he stood on the moist sand that the water had just relinquished, and as the tide line moved out he followed it slowly, pace by pace. When the waves reached towards his feet with a sudden excess of energy, he would retreat a little way toward the land. But something held him here at the water's edge, while his shadow lengthened along the sands and the cold evening wind began to rise around him.

Perhaps into his mind had come something of the wonder of the sea, and a hint of all that it would one day mean to man. Though the first gods of his people stay lay far into the future, he felt a dim sense of worship stir within him. He knew that he was now in the presence of something greater than all the powers and forces he had ever met.

The tide was turning. Far away in the forest, a wolf howled once and was suddenly silent. The noises of the night were rising around him, and it was time to go.

Under the low moon, the two lines of footprints interlaced across the sand. Swiftly the oncoming tide was smoothing them away. But they would return in their thousands and millions, in the centuries yet to be.

The child playing among the rock pools knew nothing of the forest that had once ruled all of the land around him. It had left no trace of its existence. As ephemeral as the mists that had so often rolled down from the hills, it too, had veiled them for a little while and now was gone. In its place had come a checkerboard of fields, the legacy of a thousand years of patient toil. And so the illusion of permanence remained, though everything had altered save the line of the hills against the sky. On the beach, the sand was finer now, and the land had lifted so that the old tide line was far beyond the reach of the questing waves.

Beyond the sea wall and the promenade, the little town was sleeping through the golden summer day. Here and there along the beach, people lay at rest, drowsy with heat and lulled by the murmur of the waves.
Out across the bay, white and gold against the water, a great ship was moving slowly to sea. The boy could hear, faint and far away, the beat of its screws and could still see the tiny figures moving upon its decks and superstructure. To the child - and not to him alone - it was a thing of wonder and beauty. He knew its name and the land to which it was steaming; but he did not know that the splendid ship was both the last and greatest of its kind. He scarcely noticed, almost lost against the glare of the sun, the thin white vapour trails that spelled the doom of the proud and lonely giant.

Soon the great liner was no more than a dark smudge on the horizon, and the boy turned again to his interrupted play, to the tireless building of his battlements of sand. In the west the sun was beginning its long decline, but the evening was still far away.
Yet it came at last, when the tide was returning to the land. At his mother's words, the child gathered up his playthings and, wearily contented, began to follow his parents back to the shore. He glanced once only at the sea again. Without regret he left them to the advancing waves, for tomorrow he would return and the future stretched endlessly before him.
That tomorrow would not always come, either for himself or for the world, he was still too young to know.

And now even the hills had changed, worn away by the weight of years. Not all the change was the work of nature, for one night in the long forgotten past something had come sliding down from the stars, and the little town had vanished in a spinning tower of flame. But that was so long ago that it was beyond sorrow or regret. Like the fall of fabled Troy or the overwhelming of Pompeii, it was part of the irremediable past, and could rouse no pity now. On the broken sky line lay a long metal building supporting a maze of mirrors that turned and glittered in the sun. No-one from an earlier age could have guessed its purpose. It was as meaningless as an observatory or a radio station would have been to ancient man. But it was neither of these things.

Since noon, Bran had been laying among the shallow pools left by the retreating tide. He was quite alone, though the machine that guarded him was watching unobtrusively from the shore. Only a few days ago, there had been other children playing beside the blue waters of this lovely bay. Bran sometimes wondered where they had vanished, but he was a solitary child and did not greatly care. Lost in his own dreams, he was content to be left alone.

In the last few hours he had linked the tiny pools with an intricate network of waterways. His thoughts were very far from Earth, both in space and time. Around him now were the dull, red sands of another world. He was Cardenis,

prince of engineers, fighting to save his people from the encroaching deserts. For Bran had looked upon the ravaged face of Mars; he knew the story of its long tragedy and the help from Earth that had come too late. Out to the horizon the sea was empty, untroubled by ships, as it had been for ages. For a little while, near the beginning of time, man had fought his brief war against the oceans of the world. Now it seemed that only a moment lay between the coming of the first canoes and the passing of the last great Megatheria of the seas.

Bran did not even glance up at the sky when the monstrous shadow swept along the beach. For days past, those silver giants had been rising over the hills in an unending stream, and now he gave them little thought. All his life he had watched the great ships climbing through the skies of Earth on their way to distant worlds. Often he had seen them return from those long journeys, dropping down through the clouds with cargoes beyond imagination.
He wondered sometimes why they came no more, those returning voyagers. All the ships he saw now were outward bound; never one drove down from the skies to berth at the great port beyond the hills. Why this should be, no one would tell him. He had learned not to speak of it now, having seen the sadness that his questions brought.

Across the sands the robot was calling to him softly. "Bran," came the words, echoing the tones of his mother's voice,"Bran - its time to go".
The child looked up, his face full of indignant denial. He could not believe it. The sun was still high and the tide was far away. Yet along the shore his mother and father were already coming toward him.
They walked swiftly, as though the time was short. Now and again his father would glance for an instant at the sky, then turn his head quickly away as if he knew well that there was nothing he could hope to see. But a moment later he would look up again.

Stubborn and angry, Bran stood among his canals and lakes. His mother was strangely silent, but presently his father took him by the hand and said quietly, you must come with us Bran. Its time we went. The child pointed sullenly at the beach. "But its too early. I haven't finished".
His father's reply had no trace of anger, only a great sadness. There are many things Bran, that will not be finished now. Still uncomprehending, the boy turned to his mother. "Then can I come again tomorrow"?

With a sense of desolating wonder, Bran saw his mother's eyes fill with sudden tears. And he knew at last that never again would he play upon the sands by the azure waters; never again would he feel the tug of the tiny waves about his feet. He had found the sea too late, and now must leave it forever. Out of the future, chilling his soul, came the first intimation of the long ages of exile that lay ahead.

He never looked back as they walked silently together across the clinging sand. This moment would be with him all his life, but he was too stunned to do more than walk blindly into a future he could not understand.
The three figures dwindled into the distance and were gone. A while later, a silver cloud seemed to lift above the hills and move slowly out to sea. In a shallow arc, as though reluctant to leave its world, the last of the great ships climbed towards the horizon and shrank to nothingness over the edge of the Earth.

The tide was returning with the dying day. As though its makers still walked within its walls, the low metal building upon the hills had begun to blaze with light. Near the zenith, one star had not waited for the sun to set, but already burned with a fierce white glare against the darkening sky. Soon its

companions, no longer in the scant thousands that mankind had once known, began to fill the heavens. The Earth was now near the centre of the universe, and whole areas of the sky were an unbroken blaze of light. But rising beyond the sea in two long curving arms, something black and monstrous eclipsed the stars and seemed to cast its shadow over all the world. The tentacles of the Dark Nebula were already brushing against the frontiers of the solar system....

In the east, a great yellow moon was climbing through the waves. Though mankind had torn down its mountains and brought it air and water, its face was the one that had looked upon Earth since its history began, and it was still the ruler of the tides. Across the sand the line of foam moved steadily onwards, overwhelming the little canals and planing down the mangled footprints.

On the sky line, the lights in the strange metal building suddenly died, and the spinning mirrors ceased their moonlight glittering. From far inland came the blinding flash of a great explosion, then another, and another fainter yet.

Presently the ground trembled a little, but no sound disturbed the solitude of the deserted shore. Under the level light of the sagging moon, beneath the myriad stars, the beach lay waiting for the end. It was alone now, as it had been at the beginning. Only the waves would move, and but for a little while, upon its golden sands.
For mankind had come and gone.

THE END